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# THE METAL INDUSTRY

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ELECTRO-PLATERS REVIEW
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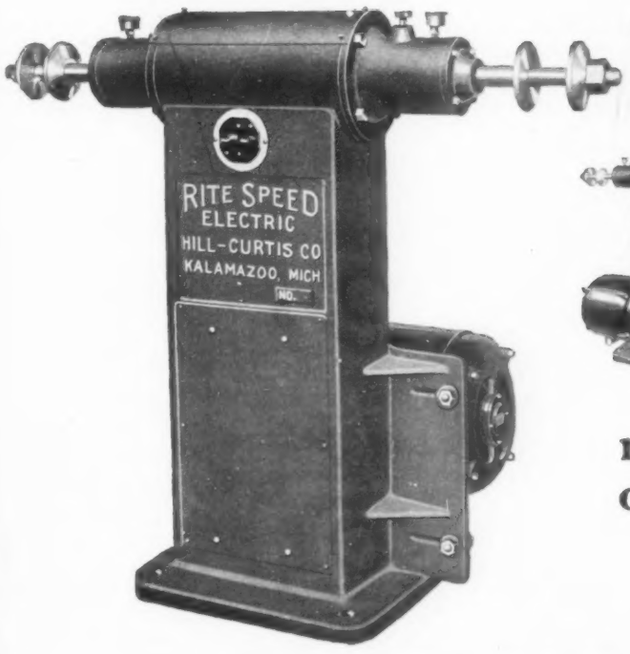


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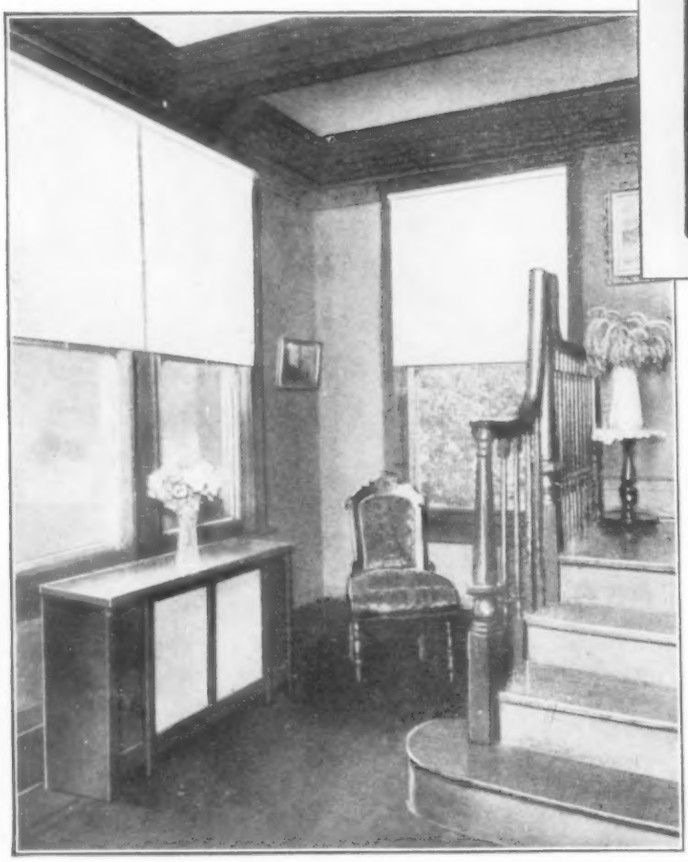
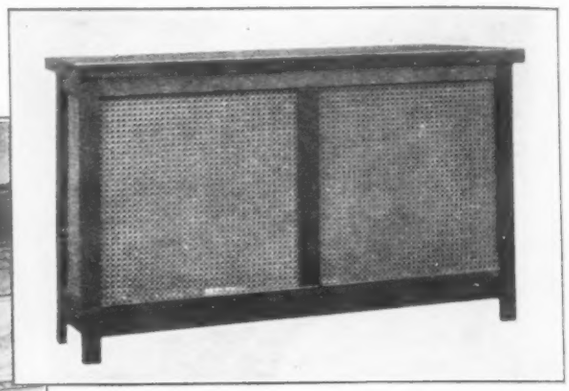
# Egyptian Lacquer makes *DECO-STEEL* more *DECO-RATIVE!*





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THE
# METAL INDUSTRY
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THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 25 NEW YORK, DECEMBER, 1927 No. 12

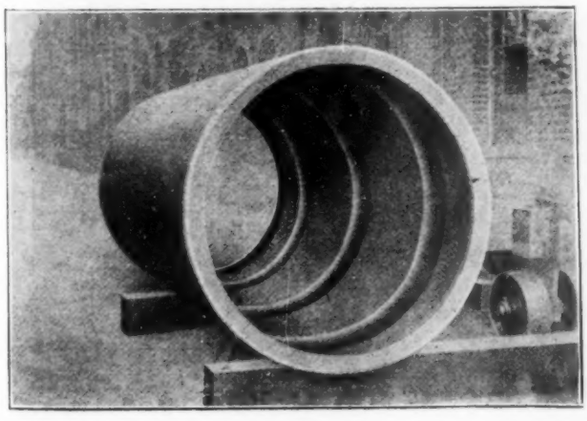
# Manufacturing Seamless Copper Tubes Electrolytically

## A New German Process for Making Smooth Tubes of Large Diameter by Electrolysis

Written for The Metal Industry by JAMES SILBERSTEIN, Metallurgical Engineer

A process has recently been developed in Germany for manufacturing seamless copper tubes and cylinders electrolytically. The characteristics of the process is that the metallic particles, while being precipitated, are subjected to constant mechanical working, which causes a unification of the deposit and produces physical properties in the resulting material, such as are not obtained by any other electrolytic process.

The manufacture of a seamless copper cylinder according to this process is as follows: Copper ore is smelted and refined in a furnace, where the copper content is brought up to 97 to 98 per cent. The molten metal is then poured into cast iron molds in the requisite shape for the anodes. These have the form of curved plates, the curvature approaching, as nearly as possible, the circumference of the cylinder to be produced. The anodes are inserted in lead-lined wooden vats, measuring about 16½ ft. in length and having a width of about 4 ft. They are placed as nearly as possible concentrically around the cathode, which consists of a perfectly straight and truly cylindrical length of copper tubing fitted with bottoms and journals at both ends. The journals are placed in bearings so that the cylinder can turn round freely. Sometimes a fusible metal core is used instead of the copper cathode. The cathode is turned slowly by means of link chains and sprocket wheels of a non-corrosive metal, located between two rows of vats. The cathode is in metallic connection with a slip ring, which revolves with it, a brush contact being provided which is connected either to the return lead or to the anode of the next vat.



ELECTRO-DEPOSITED CYLINDER WITH INTERNAL FLANGES

The solution used in the process contains copper sulphate and a surplus of about 4 per cent free sulphuric acid. At the beginning of the process, the vats are filled with this solution almost to the top, so that the cathode cylinder is covered completely.

After the current is switched on, a smoothing tool is applied to the layer of the precipitate forming on the surface of the rotating cathode. The smoothing tool is attached to a special device which moves it continually from one end of the cathode to the other, a guide ensuring that its motion is always parallel with the axis of the cathode cylinder.

With the current densities of 19 to 23 amps. per sq. ft. employed in this process, the formation of warts on the surface of the precipitate would ordinarily be inevitable. By using the smoothing tool, however, this is obviated completely, the surface produced being perfectly smooth, and looking as if it were polished. Moreover, all parts of the precipitated layer possess uniform strength.

The chemical reaction which takes place in the precipitation of copper by electrolysis are so well known that a discussion of them may be omitted. The only thing to be said in this connection is that the chemical processes and their control in manufacturing production are something different and considerably more difficult than electrolysis in a laboratory, chiefly due to the harmful and disturbing effects of secondary and eddy currents and also to phenomena of polarization which may occur. Further trouble may be caused by impurities contained in the raw materials or the water used for the solution, whereas, in a laboratory, the materials employed are all chemically pure.

A vigorous, efficient circulation of the solution is of the greatest importance. This purpose is served by elevated tanks, fed by pumps made of hard lead or other non-corrosive materials, which supply the vats with a continuous stream of fresh solution, which is delivered to them through a distributing system of lead pipes.

When the precipitated layer of copper has reached the desired thickness, the solution in the vat is drained off into a collecting vat placed underneath. The finished tube can now be lifted out of the vat together with its core; the latter is then removed either by using a roller device to loosen the tube, or by melting out the core if it consists of an easily fusible substance.

The tube thus produced is completely finished and does not need any kind of subsequent working. After being cut to the desired length, it is ready to be shipped. It is perfectly straight and truly cylindrical, while both its inner and outer surfaces are quite smooth.

The material of such an electrolytic tube possesses properties that are usually not obtained with ordinary commercial copper. It is particularly remarkable for its toughness. A subsequent mechanical working of the tubes in tube rolling mills or tube drawing benches is employed only in the manufacture of smaller tubes, or if the tubes are to be used for purposes for which great toughness is less important than hardness and resiliency. Copper cylinders with a tensile strength of as much as 60,000 lbs. per sq. in. can be produced in this way. The toughness of the copper in an electrolytic cylinder is so great that turnings obtained by turning the cylinder in a lathe can be drawn down to the very thinnest copper wires, without having to be previously annealed.

The possibility of producing seamless copper cylinders up to diameters of 8¼ ft. with any desired wall thickness, and of an absolutely cylindrical shape is of great importance for certain industries, especially the textile and paper industries. Experience has shown that welded or soldered seams either disfigure the fabric of the bands of paper, or leave other undesirable traces.

By using cathode cores of low melting point metals or alloys, it is possible to manufacture any kind of hollow bodies of circular section like conical tubes, corrugated tubes or tubes with internal flanges. A cylinder with internal flanges is shown in the figure on page 487.

# Shrinkage Cavities in Cast Alloys*

At the meeting of the Institute on Thursday, September 8, in the Lecture Hall of the Derby Municipal Technical College, Sir John Dewrance again occupied the chair. The President stated that W. A. Cowan, Assistant Chief Chemist in the Research Laboratories of the National Lead Company, New York, was present that morning, and had brought with him the synopsis of a paper which he proposed to present at the next spring meeting of the Institute. In order to give time for the preparation of discussion, he thought it would be a good plan if Mr. Cowan read this synopsis there and then; he therefore called upon the author to present his contribution.

The full title of the paper was "Minute Shrinkage Cavities in Some Cast Alloys of Heterogeneous Structure." Mr. Cowan opened by stating that shrinkage phenomena accounted for various kinds of cavities in cast metals. These occurred at spaces where liquid metal solidified last. The mechanism was more readily explained, and the locality controlled, in homogeneous than in heterogeneous alloys. In certain of the latter, minute cavities were attributed to the shrinkage of small amounts of a relatively low freezing point component, which froze last, after the bulk of the alloy had solidified at higher temperatures. Where this remaining liquid segregated, minute cavities were formed because some shrinkage necessarily took place, accompanying the change in volume between the liquid and solid phases of the component. As an instance of alloys in which this phenomenon took place, some tin-base alloys were found to contain minute cavities when small percentages of lead were present, but to be practically free from such cavities when no lead was present. The bulk of the alloys investigated were composed of a solid solution of antimony in tin, solidifying at 237 deg. C., while the small amount of eutectic mixture of this with lead, which was present, solidified at a lower temperature, namely 183° C. In doing so, it produced minute shrinkage cavities. The examination of the microstructure of alloys containing some lead showed cavities located at the eutectic areas, probably between crystalline grains, while the microstructure of a similar alloy, without lead, showed no cavities. The shrinkage cavities were found to occur both in commercial ingots and in specimens prepared in the laboratory. Cavities in cast metals were formed by other agencies, namely, solid inclusions, gases, etc.; again, defects caused by polishing might be interpreted as cavities in some cases.

* Extract from Engineering 16/9/27.

MEMBERS OF THE BRITISH INSTITUTE OF METALS AT DERBY, ENGLAND

# Silica And Magnesite Bricks In Metallurgical Furnaces

## A Description of the Properties and Requirements of These Refractories for Metal Melting

Written for The Metal Industry by GERHARD WOLFF, Metallurgical Engineer

Ceramically speaking, refractory materials are such that may be subjected to a temperature of at least 2,700° Fahr. without suffering deformation. From a metallurgical point of view this definition is as narrow as that describing a horse as being an animal with four legs and a tail. Whilst refractoriness is a fundamental characteristic of all the materials employed in furnace construction, the various chemical and physical influences acting upon the refractories, such as the deteriorating effects of vapors, gases, slags, and fused metal, fluctuations of temperature, pressure, etc., really are of much greater immediate interest, particularly since it is easy enough to find refractories of sufficiently high softening and melting temperatures to stand the comparatively moderate heats involved in general non-ferrous metallurgy.

There can be no doubt that the refractory most generally used is fire-clay. Since in contrast to all of the other common refractories it does not represent one definite substance or compound, but a mixture of various acid and basic components, its properties may be greatly influenced by suiting the composition of the refractory mixture to the large variety of conditions involved.

Next important, quantitatively and qualitatively, are silica and magnesite bricks, although in spite of their undisputed suitability for a great number of purposes, they are quite frequently used by many smelters for purposes where the cheaper fire-clay bricks, correctly composed, would have done the same, if not appreciably better service. It is the purpose of this article to point out the characteristic advantages and disadvantages of silica and magnesite bricks and their limits of usefulness for metallurgical purposes.

The general suitability of refractories depends upon their respective attitudes towards the following requirements:

(1) High softening and melting points under the influence of gases and vapors, and under normal loads.

(2) Sufficiently strong resistance against all intended and accidental fluctuations of temperature.

(3) Chemical and physical inertness towards the dissolving influence of fused metals, alloys, fluxes, and slags, and towards the corrosive effects of metallic and chemical vapors and the gases of combustion.

(4) Least possible changes of shape and volume under all practical working conditions.

(5) Mechanical strength, and a high degree of resistance against blows, shocks, erosion etc., in the hot and cold state.

(6) High or low thermal conductivity—depending upon the individual requirements.

(7) A high degree of durability, that is to say, retention of the above properties after long periods of heating at maximum temperatures and under the normal conditions of the metallurgical processes.

(8) Uniform composition and methods of production of refractories of equal quality and designation.

(9) Perfect workability when laying, accurate and uniform measurements, and smooth and sharp edged surfaces.

### SILICA BRICKS

The raw materials used in the production of silica bricks, quartzite as a rule, are never pure but are contaminated with ferric oxide, lime, magnesia, and alumina, the silica contents ranging from 90 to 97 per cent. with 1 to 4 per cent. alumina, 0.5 per cent. ferric oxide, 1 to 3 per cent. lime, and small percentages of magnesia. Normal percentages of magnesia do not deteriorate the refractory properties of silica, whilst up to certain percentages alumina, ferric oxide, and lime are positively advantageous and must be added—if absent—to assure of sufficient fusibility of the raw material to form solid bricks.

Comprehensive experiments carried out by K. Endell and R. Harr (Stahl und Eisen, Vol. 46 (1926) pp. 1870/76) have shown that the alumina contents of silica bricks should in no case exceed 1.5 per cent., since it influences unfavorably the transformation of the quartz into tridymite, the eminent importance of which will be brought out later. Percentages of lime of up to 8 per cent., on the other hand, support the formation of tridymite and does not lower the softening temperature of the silica bricks under load. Iron oxide in amounts of 4 per cent. is most effective in accelerating the transformation of quartz into tridymite and does not lower the softening temperatures of the bricks. However, on account of its deteriorating effects in other directions, the maximum amounts of iron permissible should not exceed 0.5 to 1.0 per cent.

The porosity of silica bricks is not appreciably altered by increasing the contents of lime, but increases with rising percentages of alumina and decreases with rising percentages of iron oxide. A certain degree of porosity is desirable, of course, since it decreases the coefficient of thermal conductivity and improves the resistance of the bricks against spalling and cracking. This porosity must not express itself in large isolated pores but in evenly distributed, uniformly small pores which on heating the bricks to the high temperatures of the process will be closed up along the exposed sides of the bricks, preventing the penetration of deteriorating gases and substances into the structure.

The mechanical strength of the bricks in the cold state is not changed by rising contents of lime. It is slightly decreased by considerable amounts of alumina and rises with increasing iron oxide contents.

The softening temperature under a load of 14 lb./sq. in. is not changed by lime contents of up to 6 per cent. Increasing the iron contents to 6 per cent. decreases the softening point by only 20°C, whilst appreciable quantities of alumina cause a considerable lowering of the softening points, even in presence of lime or oxide of iron. Presence of 2 and 6 per cent. $Al_2O_3$ cause a decrease of 125°C and 275°C respectively.

The chemical composition as well as the refractoriness of the raw silica material alone do not, however, determine the suitability of refractories for brick making purposes, the mineralogical character of the grains also being of considerable importance. Best results are obtained where the quartzite grains in the brick are separated from one another by an amorphous silicious bond. Chemical analysis of the brick material is of only subordinate importance, therefore, whilst the refractory properties of silica bricks are mainly influenced by the kind and size of grains, the percentage of the quartz fused during burning as well as the structural changes incurred, that is to say, the degree of transformation of the quartz into cristoballite and tridymite.

This process of transformation is of greatest practical importance to metallurgists since it determines the stability of shape and volume of the bricks in service, their durability and—particularly—their resistance against abrupt changes of temperature. It will be interesting, therefore, to discuss this point in greater detail.

Silica may consist as alpha and beta modification of three crystalline phases, quartz, cristoballite, and tridymite. On heating the quartz or quartzite to a sufficiently high temperature (2650 to 2800°Fahr.) for a prolonged period, it is changed to cristoballite and, finally, to tridymite, the degree of transformation being determined by the duration and temperature of the burning process and the nature and amount of fluxing material present. Under ordinary condition, silica bricks as sold to the smelters rarely contain more than 65 to 75 per cent. of tridymite, the transformation of the rest of the quartzite and cristoballite taking place gradually in the metallurgical furnaces. It has been claimed that throughout this final stage of transformation, the bricks will go through a period of decreased strength and resistance, but this is of no practical importance, since at the end of this period the fully transformed brick is in no way inferior to the bricks burned completely to tridymite in the first place.

The most important practical difference between these three modifications of silica is the considerable increase of volume which accompanies the transformation of the alpha modification of quartz and cristoballite into the beta modification, the expansion of quartz, taking place at about 1070°Fahr., being three times as large as that of tridymite which is transformed into the beta-modification at about 400°Fahr. It is obvious that on passing the critical temperature of quartz too rapidly, the structure of silica bricks, containing large percentages of this crystalline phase of silica, is seriously stressed and their resistance against deteriorating influences weakened accordingly.

In view of the fact that the change of quartz into tridymite is also accompanied by an increase of volume of 14.2 per cent., it is clear that the value of silica bricks increases with the degree of transformation to tridymite, although the increases obtained from this source are rather gradual and final, while the increase of volume resulting from the change of the alpha modification of quartz and cristoballite into the respective beta modifications is followed by a corresponding decrease as soon as the temperature is lowered below the critical temperatures.

The factors mainly inducive to the conversion of large percentages of quartz into tridymite within a reasonably short time are:

(1) High burning temperatures. While in Europe these temperatures are usually fixed between 2650 to 2750° Fahr., they have been raised to about 2775 to 2825°Fahr. in the United States.

(2) The presence of certain percentages of impurities, such as lime and iron oxide. In presence of 2 per cent. of lime and at a temperature of 750°Fahr. most of the quartz is transformed into tridymite within a few hours. Particularly effective in this respect is ferric oxide which acts as catalyst. Excessive amounts of iron oxide must be guarded against, however, since the carbon monoxide present in the gases of combustion tend to reduce the oxide to metallic iron which in contact with elementary carbon also produced forms carbide of iron. The reduction of carbon monoxide to carbon by metallic iron may take place anywhere within the structure. On reoxidation, the monoxide formed acts towards increasing the volume, causing excessive stresses and, consequently, the formation of cracks and channels within the structure.

(3) Correct grain size of quartz. As a rule, the smaller the grain, the more perfect and rapid the conversion into tridymite, although the exact degree of granulation depends upon individual circumstances. In Europe, a mixture of equal parts of powdered quartz grains of 0.04 to 0.12 in., and grains of 0.12 to 0.28 in. is usually employed, whilst in America, modern tendencies are directed towards a reduction of grain size, 45 to 50 per cent. of the material being reduced to a grain size of 0.01 inch.

Quartzite is less subjected to increase of volume than quartz.

If the raw materials used do not contain a sufficient amount of impurities to serve as bond, lime is added to make up the difference. Apart from lime, the following bonding substances have been proposed: Magnesium chloride, calcium chloride, water glass, alum, molasses, tar, etc.

In the manufacture of dinas bricks, clay is used as bonding material instead of lime. While the content of lime in silica bricks fluctuates between 1 to 2.5 per cent. the amount of clay in dinas bricks may reach 10 per cent.

### PROPERTIES OF SILICA BRICKS

Silica bricks, such as sold to the smelters, must be strong and ringing, edges and corners must be thoroughly vitrified and should not crumble either in the cold state or, with correct use, at the normal temperatures of the process and at moderate temperature fluctuations. They are highly refractory and must not fuse at temperatures below Seger cone No. 33, the usual melting points being from 3100 to 3150° Fahr. The refractoriness of good quality silica bricks thus compares favorably with first class fireclay and bauxite bricks. The melting points of magnesite and carborundum bricks is considerably higher, however, exceeding that of silica bricks by about 800°Fahr. and 1000°Fahr., respectively. The specific refractory advantage of silica bricks lies in the small difference between melting points and the respective softening points under load, the latter remaining within about 150°Fahr. of the former. Fire-clay and bauxite bricks soften at 2420°Fahr., whilst magnesite bricks crumble at 2570 to 2770°Fahr., as against a softening point of silica of 2900 to 3100°Fahr.

In building a furnace, the temperatures of which reach or even exceed the softening and melting points of silica bricks, the roof and the lining should be relieved of all unnecessary loads. For this reason, the roof should not be supported on the lining but on the outside layers of the furnace walls, while additional loading of the furnace walls with iron construction for the mounting of blowers, ventilators, chutes, etc., should under no circumstances be permitted. The tie rods must not be pulled up too tight and should be gradually relieved with rising temperatures.

Consideration must also be paid to the comparatively high degree of expansion possessed by silica bricks, since if this factor is not taken care of by providing for expansion space, the bricks are subjected to excessive compressive stresses, long, wide cracks being formed across the walls of the furnace. A silica brick containing 94.8 per cent. $SiO_2$ and 2.1 per cent. CaO, and with a melting point of No. 33 Seger cone, a specific weight of 2.36, and a porosity of 23.08 per cent., possesses a linear expansion of 1.1 per cent of 2750°Fahr. In copper refining furnaces, for instance, ¼ inch of expansion space is allowed per 1 foot of roof, and 5/16 inch per 2 ft. of bottom.

Being subjected to the most intensive heat, the roof must be laid with particular care. If the bricks are shaped so that at a good fit of the lower side of the roof the upper edges of the bricks stand ajar, the gaps being filled up with mortar, the weight of the roof will force it to reach an equilibrium, that is to say, its center will gradually lower until the upper edge of the bricks have approached each other as far as the resistance of the com-

pressed mortar will permit. By this movement, an exceedingly strong pressure is exerted upon the lower parts of the bricks, and the combined influence of this pressure and the working temperatures of the furnace will cause "dripping" of the roof.

It is a perverted idea of economy to make the walls and roofs of high temperature furnaces as thick as possible or to cover the roof with a heavy layer of sand "in order to save heat." This is particularly true of electric arc furnaces where the roof and wall are exposed to excessively high temperatures which often exceed the melting points of the refractory material. For any given temperature above the melting point of the refractory an equilibrium is formed which, in dependence on the softening point, the thermal conductivity, and the outside temperatures, is expressed by a certain wall-thickness. If the wall thickness or the furnace temperature exceed this equilibrium, the inner surface of the walls or roof commence to melt away until the equilibrium is attained.

The same is true of the corrosive action of the products of the melting process, which decreases with increasing cooling effect of the outside temperatures. One of the most interesting examples of this fact is the corrosive action of the antimony slag on the fireclay bricks in lead refining furnaces. As a rule, the walls of these furnaces are made 25 inches thick and provided with a cooling jacket, but this does not prevent the antimony slag from cutting its way deeply into the refractory lining at the surface line of the bath. This corrosive action proceeds until only about 6 to 8 inches of wall remain, when the cooling action of the water jacket becomes effective. The author has repeatedly called attention to this fact and has proposed to place the cooling jackets into the walls of the furnaces, supporting the walls extending beyond the jackets with I-beams.

The walls of ordinary high temperature reverberatory furnaces, such as copper refining furnaces, should not therefore be thicker than 18 inches, consisting of a 9-inch lining of silica bricks and an outer layer of ordinary fire bricks. The thickness of reverberatory and electric furnace roofs should not exceed 9 inches.

The specific weights of silica bricks must not exceed 2.4, corresponding to a degree of transformation of 70 to 80 per cent. The coefficient of porosity ranges from 19.5 to 22.5 and should not exceed the latter figure, since excessive porosity decreases the resistance of the bricks against sharp fluctuations of temperatures and heavy mechanical stresses. Another disadvantage is the high degree of absorption of slags and gases causing the gradual disintegration of the structure of the bricks.

It is almost impossible to test correctly the quality of silica bricks in the smelter by the experiments usually applied, since the Seger cone tests do not permit conclusions to be drawn concerning the important properties of the bricks, excepting, perhaps, the melting points, which in the case of silica bricks are quite uniform. The determination of the specific weights also will not give dependable results since it does not consider the degree of transformation of different modifications and phases of silica and the varying degrees of porosities.

The most important and almost universally employed method of testing the resistance of the refractory material against temperature fluctuations, the quenching of the red hot bricks in running cold water, also is not conclusive if carried out without knowledge of the degree of burning to which the bricks have been subjected. The resistance of insufficiently burned bricks is much more pronounced than that of perfectly burned material, since the bonding substances have not been vitrified and combined with the refractory bases sufficiently to destroy their inherent high degree of resistance.

Silica bricks are very sensitive towards abrupt changes of temperature, being only little superior to magnesite bricks in this respect. Whilst, however, this unfortunate property of magnesite bricks is generally known and countered by suitable measures, silica brick work is often treated as carelessly in this respect as fire clay brick which under normal circumstances is practically insensible to moderately abrupt temperature fluctuations. The following table indicates the relative degrees of resistance of the various common refractories, the resistance value of magnesite bricks being taken as 100:

Magnesite bricks 100.
Silica bricks 75.
Chromite bricks 42.
Fire clay bricks 3 to 10 (First grades).
Fire clay bricks 10 to 15 (Good grades).
Fire clay bricks 15 to 30 (Low grades).
Zirconia bricks 16.
Bauxite bricks 13.
Carborundum bricks 2.

However, in judging the source of difficulties, such as spalling and cracking, attention must be paid to the fact that the different symptoms are not indicative of certain definite causes, but may be induced directly or indirectly by a number of other factors. For instance, whilst spalling may be caused by insufficient resistance against abrupt changes of temperature or by excessive temperature fluctuations, respectively, it is frequently due to heating up the new furnaces too rapidly in the first place, the steam produced from absorbed moisture being generated too rapidly to escape from the pores of the bricks, weakening the structure sufficiently to cause spalling and cracking even at moderate thermal stresses. Similarly, chemical influences on the part of the products of reaction and the firing gases may be the basic cause of spalling and—on the other hand—of the softening of the bricks which is commonly charged to excessively low softening or melting temperatures under load.

Acid gases and substances as well as atmospheric oxygen, carbon, and reducing agents do not attack silica bricks at any normal temperatures. They are only weakly resistant, however, against the action of basic slags and oxides. It is for this reason, therefore, that none of the white metals, such as lead, tin, antimony, may be melted in reverberatory furnaces lined with silica bricks, the oxides and slags produced dissolving the silica and forming silicates of the metals in question. The same is true of the treatment of all metals harmless themselves but containing metals forming corrosive oxides. In refining impure copper or copper alloys containing lead or tin, only the hearth may be made of silica brick while fireclay or magnesite bricks should be used to make up the sides and the roof. Silica bricks are almost exclusively used in the roofs of high temperature reverberatory furnaces and in the hearth of copper refining furnaces, although in this case they are usually covered with a thick layer of crushed quartz or sand, which is burned in and serves as an efficient and cheap hearth material. Silica bricks are also used frequently in regenerator chambers, where they are able to expand freely and where the high degree of sensibility towards the continually changing temperatures is neutralized by the heavy layer of dust soon accumulating on the exposed surfaces of the bricks, which protects them against too abrupt fluctuation of temperatures.

### MAGNESITE BRICKS

Magnesite bricks are almost exclusively produced from crystalline raw magnesite (magnesium carbonate) which is sintered at temperatures varying from 2700 to 2900° F in blast furnaces or, more efficiently, in reverberatory

furnaces where at temperatures of from 3100 to 3300° F some of the carbon dioxide is removed. Sintered magnesite is and should not be pure but should contain at least 5 to 7 per cent. impurities, the exact amount of impurities required depending upon the physical character of the material. The most important impurity is iron oxide, which confers good sintering properties and which must be added to the raw material if it is not present as impurity. Thus, the common magnesite grades mined at Steiermark and Veitsch (Austria), Hungary, India, and California are usually preferred as refractory material to the much purer magnesite mined at Euboea, Greece, which does not sinter at any normal temperature but crumbles if calcined. The magnesite deposits in the state of Washington also do not contain appreciable quantities of iron, and pure iron ores are therefore added to the raw mixtures in requisite quantities. The iron oxide necessary for satisfactory sintering amounts to 4 to 8 per cent. On burning the bricks at high temperatures, magnesium ferrite ($MgO.Fe_2O_3$) is produced which is chiefly responsible for the sintering of the magnesia bricks.

The total impurities contained in the calcined products of some deposits are:

| | $CaCO_3$ | $Fe_2O_3$ | $Al_2O_3$ | $SiO_2$ |
|---|---|---|---|---|
| Steiermark ..... | 1.76 | 7.79 | 0.82 | 3.40 |
| Greece ..... | 0.83— —10.92 | 0.56— | 3.52 | 0.7— —7.1 |

The analysis of magnesite bricks have been reported as follows:

| | MgO | CaO | $Fe_2O_3$ | $Al_2O_3$ | SiO |
|---|---|---|---|---|---|
| Steiermark ..... | 85.31 | trace | ... | 9.05 | 4.70. |
| Greece ..... | 86.5 | 3.76 | ... | 6.64 | 3.10 |
| U. S. A..... | 87.66 | 1.19 | 8.10 | 1.19 | 2.05 |

The chief value of magnesite bricks as refractory material for metallurgical purposes are their high melting temperatures and their chemical inertness towards basic, neutral, and most acid influences even at high temperatures. Although the melting temperatures amount to 3800 to 4000° F., the softening temperatures of magnesite bricks under heavy loads are considerably lower, fluctuating between 2550 and 2900° F. By decreasing the amount of silica contained in the raw magnesite—by electro-magnetic separation—the softening temperatures may be raised considerably.

The refractoriness and durability of magnesite bricks is appreciably higher than the respective properties of silica and fireclay bricks. The chief disadvantage of magnesite bricks are their brittleness in the cold state and their lower degree of resistance against abrupt temperature changes. It has been shown above that of all the refractories employed for metallurgical purposes magnesite suffers most from rapid changes of temperature. The comparative values have also been given above.

In order to decrease the sensibility of magnesite bricks towards temperature changes and to lower the degree of spalling induced, some ceramical works are now burning the loose magnesite ores by a special process, forming and pressing the raw magnesite into bricks and burning these as usual. Although by this method the resistance of the bricks against temperature fluctuations is greatly increased, important economical and technical problems are still to be solved, particularly as concerns the development of perfect bonding materials. It is clear that the highly refractory and glassy fused magnesite particles are not held together as easily as the softer and rough-faced raw magnesite.

It is self-evident from the above that metallurgical furnace linings consisting of magnesite bricks must be treated with extraordinary care. As long as the interior of the furnace is red hot, admission of the cool outside air through the working doors does not do any appreciable harm. However, when an empty furnace lined with magnesite bricks is to be cooled down, the red hot bottom must be covered with a layer of coke fines 3 or 4 inches thick and all doors closed and carefully luted with fireclay. The bottoms of lead refining furnaces, which are often lined with magnesite bricks, are often protected by raising the tapping hole about 2 or 3 inches above the center line of the hearth—the exact distance being determined by the degree of curvature of the hearth—so that the whole of the bottom is always covered by a layer of lead which protects it against too rapid cooling as well as against mechanical stresses imposed by careless charging of the heavy slabs of lead.

Attention should here be called to the fact that the lining of lead refining bottoms with magnesite bricks is a distinct technical and economical error usually induced by unfavorable results attained with badly laid or faulty fireclay bricks. The author has seen many lead refining bottoms made of good quality firebricks and laid with due care which were more than two years old and still in perfect condition. In most of these cases this result was attained by keeping the bottoms covered with a layer of lead at all times, and it is clear that even the best of magnesite bricks would never stand the stresses of lead refining for nearly as long a period—in spite of their incomparably higher costs.

The bottom of copper refining furnaces are only rarely made of magnesite bricks although these are often used for lining the walls above the metal line and the roof, where they are more resistant against the corrosive action of the spattered copper particles containing comparatively large percentages of copper oxide which would seriously attack silica roofs. Fireclay bricks would also be very resistant, of course, but they are not sufficiently refractory for this purpose. Attention should here be called to the fact that if the walls and the roof of copper refining furnaces are lined with magnesite bricks, the bottom and the lower parts of the walls being made of silica material, a certain chemical action between the lower acid material and the basic magnesite would be induced by the high temperatures of the process. In order to avoid this, an intermediate layer of neutral chrome bricks is often interposed between the silica and magnesite lining.

Bronze and brass reverberatory furnace bottoms are frequently lined with magnesite bricks, and it appears that good quality magnesite bricks carefully laid give very satisfactory results. Indeed, the hearth will last almost indefinitely if at white heat it is treated with some basic slag or glass scrap which change the hearth into a solid block of magnesite. The quantity of slagging material employed for this purpose must be limited to the least possible amounts, however, in order to avoid the fluxing of the mortar or brick material.

On account of their low degree of resistance, magnesite bricks cannot be used in blast furnaces, but they are almost universally employed in the construction of Martin furnaces, electric steel furnaces, nozzles and converters in Thomas plants, and for the lining of the sintering zone of revolving cement furnaces. Magnesite tamping masses are also used in Bessemer converters.

The mortar used in laying the bricks consists of finely ground calcined magnesite made up to a thin paste with tar or linseed oil. Much better results are often obtained by laying the magnesite bricks in dry magnesite mortar. It is self-evident, of course, that in this case the bricks must be of accurate shape and well finished.

The electric conductivity of magnesite bricks is very low, whilst the thermal conductivity is comparatively high. The properties of magnesite bricks are greatly improved by dry storing.

# The Fundamentals of Brass Foundry Practice

## A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 14

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

All pouring of green molds is licensed on the condition that the mold will fill and the metal congeal to a surface-protecting crust formation before steam and gas generate in their greater pressures and volumes. If in a green mold, metal remained bodily active for 10 minutes after pouring, it would revolutionize foundry practice in a great many classes of work and metals. It is simply to reduce to a minimum the gases that a green mold will generate that we temper the sand to a more dry state, as we approach the limit of metal volume to which the green mold will safely function. The dividing line between green and dry molding is established partly on this condition, i.e., the metal heat and volume that can or cannot be trusted on account of gases and hardness of sand in the green mold.

Of course other deciding factors often apply independently of mere volume, as in mold of expansive and flat surface. Molds including delicate sand formations as in tablet and statuary work, molds to be poured by metal that will not take satisfactorily to green sand, molds for castings held to close limits of size and weight, etc. In these cases metal action and pressures are the main contending factors for the dry rather than the green mold.

The question when to mold green and when dry is answered fully by these two conditions — the heat action and the mechanical action of the metal. If a green mold will stand for either or both, mold green. If not, mold dry. Before going to the more expensive dry mold, however, it is often well to consider the possibilities of a slight change from ordinary practice in the green method. Many times a dry ram-up core will inexpensively remove the difficulty. Similarly a change for instance in gating and pouring. A large flat plate will illustrate. If we gate with a single delivery gate and pour strictly on the level, the heat and mechanical action of the metal will play violently on this one surface and line of transit in the mold and may result in a washed or scabbed surface. Now, by delivering the metal through a number of gates and by slightly inclining the mold in pouring we distribute the heat and mechanical action of the metal, cut down the violence of current and make the green mold safe. Fig. 51 illustrates this and will be discussed more fully in a later chapter on gating.

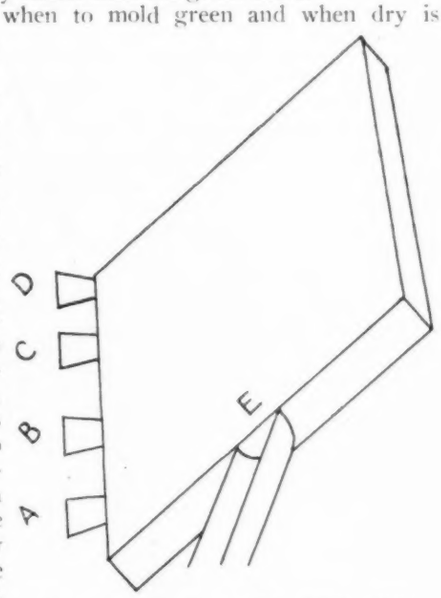



FIG. 51. PLATE GATED WITH MULTIPLE GATES AT A, B, C, D, INSTEAD OF SINGLE GATE AT E.

When molten metal engages a green sand surface that surface immediately glazes and hardens to a dry then fragile crust formed by the heat action on the natural bond of the sand. This crust seals against the gases generating immediately back of it and turns those gases backward into the sand. The bond between this crust and the background sand is a weak line of moisture moving backward with time of exposure. As long as this crust remains intact, resisting the steam action in the background and the metal action on the surface, the mold is safe in that particular, when it buckles or disintegrates, then trouble starts. By gating and pouring methods, by nailing hard pressed surfaces or by substituting dry core sections, by using green a weak facing and by different other methods this crust can be either sectionally substituuted for or mechanically protected and the dry mold eliminated.

Regarding the straining or swelling of castings a rather common error might well be corrected here. Contrary to the idea of many, the weight of metal in a mold has little or nothing to do with the strain on the mold, because liquid metal in a mold has more pressure than weight. Any green sand surface can be rammed hard enough to stand the weight of metal it supports. It can also be rammed hard enough to support the pressure of metal, but the question is, will the metal stand for that degree of hardness and compactness in green sand? Now by hydrostatics, metal pressure increases with height of column and with expanse of surface. But gases also increase with surface exposed. To mold to close limits of weight and dimension it is therefore plain that the size and shape of patterns figure more prominently than mere weight of castings made from these patterns. In all cases of resistance to metal strain, the limit of safety in green molding is the limit of compactness required to support pressure as compared with the limit of hardness the metal will stand for in the sand. When this former limit outpoints this latter limit then to mold to close weight and dimension the dry must displace the green method.

In this connection, to avoid misconstruction, a distinction is pointed out between a sand surface yielding to strain and the same surface burning severely from the heat action of the metal. A burned in casting surface is not necessarily a strained casting surface. Both may originate in the same mold condition as in soft tamping but the burned in surface has other causes and remedies quite exclusive and booked for later mention.

### THE BOND OF SAND

As a general rule sand of good natural bond is close sand fine of grain and in tamping will seal to a dangerous state wherever heat, steam and other gases are present. A naturally open and at the same time well bonded sand is almost a rarity. Sand known as French sand possesses these dual qualities but by reason of its cost is prohibitive to general use. The use of sand over and over is destructive of its bond and to restore it, new sand must be constantly added. In departing the sand,

*All rights reserved. This series will be collected and published in book form. Parts 1 to 13, inclusive, were published in our issues of July, August, September, October, November, 1926, January, February, March, April, May, August, September and November, 1927.

this bonding element, like any other thing dying, leaves its remains, a fine silt that clogs up the sand body and lowers the permeability. When it is remembered that new sand is in full retention of its virgin elements and rich in organic matter that is converted to considerable volumes and pressures of gases, the mere revivifying old silted sand with expensive new sand will appear a rather costly method of getting an inferior product. But if new sand added to old (now long the method) is to remain the system, it is high time that many foundries were concerning themselves about proper ways in detail. In adding new sand to old, the required amount to restore bond should be exactly determined and measured. The old sand should be aerated of its silt before the addition; the new sand should be screened and added in rather dry state. The old and new should be thoroughly mixed together before adding water. After adding water the sand should be thoroughly mixed and left to lie at least over night to season. Required additions of new sand should be made daily.

Mold gases and gas pressures (not metal gases) are of two orders, those deriving from heated air in the open mold, and those resulting from moisture and organic matter in the sand. The former are absolutely non-prohibitive and can be dealt with only by providing them free and ready escape through the sand. The most control we have over them is to gate and vent against their entrapping in the metal or against it. Regarding the sand gases the old "ounce of prevention" adage is eminently applicable. It is by far better and indeed safer to limit sand gases than to exhaust them. Excess steam in sand of course proceeds from excess moisture in the sand. This moisture is often added by poor molders to strengthen the bond of the sand in the construction of the mold. It will do that, but when that is done, all is said. The action of the metal in the mold is a different story. Any sand requiring copious moisture to establish its bond cannot enter safe foundry practice unchallenged. Gases of organic origin come from volatile matter in the sand and can be reduced by eliminating this matter to a minimum. These organic gases are generated mainly in the mold wall surfaces engaged by the metal and extend their generating activities to the depth of the heat action in consuming the volatile matter. Foundries will often find it advisable to take advantage of this principle by using a prepared sand low in volatile matter as a facing against the pattern and to the depth of this heat action. It is quite clear that such a facing can contain little if any new volatile sand and must depend on some supplied constituent, not volatile, for its body and its bond. A facing of this nature frequently used by the author consists of 90 parts old sand free of silt, 8 parts pulverized fire clay, and 2 parts sea coal. To the water moistening this mix a small amount of glycerine is used (¼ oz. to the gallon of water) to prevent edge and surface drying of the sand in the mold while manipulating.

The exact extent to which organic gases, sand derived, disturb metal in a mold causes conflicting opinion among foundrymen. The author's conviction is that this effect can be and is considerably over estimated. He believes further that when metal does suffer disastrously from sand gas, this gas is the more likely to be the more potent and active steam gas, than that deriving from volatile sand matter. He is less inclined to the importance of volatile matter in view of the green sand flour facing previously referred to. This facing is comparatively rich in supplied volatile bond matter, yet when properly used it hardens under the metal influence to a crust that protects the metal against its own and other gases from the background sand. A further item of weight is that new and old sand mixed and tempered together properly on a 50-50 basis shows little if any more tendency to inflict a gaseous penalty on castings than old sand alone, identically tempered.

Steam is among the more powerful of known gasses. It generates quickly and asserts itself violently. The fact is that if mold sand be over damp to the degree of generating steam on the immediate presence of metal little hope can be held that that steam will escape through any permeability or vent of sand and leave the metal undisturbed. Organic gases in sand are not nearly so assertive. They generate more slowly and increase their pressures less suddenly. Now the gases that generate suddenly and increase violently are the dangerous ones in a mold and leads to the inference that in a green mold, condition of sand regarding moisture and uniformity is a matter of greater import than native volatile matter in the sand. The primary effect of mold gas on metal is displacement. Where the metal is fluid violent boiling ensues which tears away the sand of the mold encompassed. On viscous metal, the gas presses laboriously in and is usually entrapped. On plastic metal the usual effect is the inward recession of the casting surface from the mold wall. Since in passing from fluid to solid state metal must pass all stages, viscous, semi-plastic, plastic, etc., the different effect of gases as exhibited by castings can be easily understood. Regarding the power of a mold gas to penetrate or to break up and scatter after penetrating the fluid metal to the honeycombed effect in the casting, the author can find little either in theory or in practice to stabilize the proposition. Metal gases acting from within the metal body outward observe this effect but not mold gases striking from out the metal body inward. The simmering or dancing tendency sometimes observed by metal in "setting" and showing as a honeycombed skin of the casting may originate over a hard mold surface or a slightly over-damp surface, but no gas of volume and pressure from without will divide its activities under compression required to penetrate a liquid of metal density. It will rather unite with it.

Returning to the subject of organic gas and its disputed importance, it is interesting to note the experience of foundries that have attempted to better their castings and at the same time reduce their sand bills by either eliminating new sand altogether from their heaps or culling it to an absolute minimum. The cases in mind represent the dual objection of the reclamation of sand and the limiting of its volatile matter, quality of casting being paramount and saving in sand bill the secondary consideration. The one case is that reported by paper at the 1926 Foundrymen's Convention held at Detroit and submits the findings of the joint authors, R. F. Harrington, M. A. Hosmer and A. S. Wright of the Hunt-Spiller Manufacturing Company, Boston, Mass., where the work was carried out. Their efforts followed the trend of revivifying old sand by the use of clay bond and in result can be summarized in the following extract from the paper:

"The molding sand heaps throughout the entire plant now employ clay bond. An appreciable saving has been made through its use. However, more important, quality has been maintained, which as stated early in the article, was paramount."

Another foundry has been experimenting along the clay bond line and because of the peculiar nature of their work have put greater stress on the elimination of volatile matter and the permeability of the sand. To this end new sand is cut to a very low quantity of addition. Old sand is well aerated and revivified with pulverized fire clay. To favor permeability, a quota of old core-butts burned out and crushed along with other gatherings of old sharp sand, is added in needed ratios. Sea coal is included in small ratios as well as the small amount of glycerine previously referred to. This foundry has passed the experimental stage with this process and is now using it at a considerable saving of money and improvement in their castings.

**This series will be continued in a later issue.—Ed.**

# Greek and Roman Cups

## This Is the Second of a Series of Articles on the Drinking Vessels of Olden Times

**Written for the Metal Industry by A. F. SAUNDERS, Designer, Benedict Manufacturing Company.**

The appreciation of beautiful form, with the ability to create it, which was so characteristic of the people of ancient Greece, is nowhere better expressed than in the shapes of their drinking vessels made for household and religious use. These vessels were designed with intelligent skill to serve in the most practical manner the purpose for which they were intended. This combined with the highest ideals of artistic beauty has provided a fruitful source of inspiration for the modern designer in the precious metals.

During the great age of Greek art commonly referred to as the Periclean Period (444-429 B.C.), the art of both the potter and the metalsmith reached an exceptionally high state of artistic development. Much thought had been given to the analyzing of what constitutes that most elusive thing called beauty of form and it took them several centuries to work out and prove certain fundamental principles to be without doubt the correct basis of artistic beauty. These principles are as sound and are as applicable to our modern conception of art as when they were formulated over two thousand years ago. These art loving people seem to have been the first to delight in pure beauty of form and line ornament, apart from symbolism and representation, and it was this constant striving after an ideal perfection of form that gave Geek art its immortal freshness of beauty and vitality of interest.

With the invention of the potter's wheel, the use of such primitive materials for cup making, as the horns and skins of animals, gourds, shells, etc., was gradually supplanted by the more easily worked clay, as its plastic nature made possible a seemingly endless variety of forms and never has there been achieved greater excellence in the formation of beautiful shapes in vessels than is found in the pottery of ancient Greece.

For pure beauty of form, the result of perfect proportions, the Greek "Kylix" unquestionably excels all other drinking vessels of ancient times. It is perhaps the most nearly perfect form of cup ever conceived by man and it seems safe to say that more thought has gone into the artistic development of the ancient "Kylix" than holds true of any other form of vessel and it illustrates clearly with what care the relation of the height to the width and the proportion of various parts to the whole were designed with a view to the harmonious effect as well as to serve a practical use. When formed of clay the body of the "Kylix" was so wide and shallow as to suggest a saucer with two horizontal handles and supported upon a moderately tall foot. In its more ancient form the bowl is deeper and rests on a low moulded foot, the two handles being placed lower down on the body. When made in metal the form becomes richer, the handles are usually elongated and bolder in curvature and the foot is of larger proportions. At its best stage of development, indicated by Fig. 3, Plate 3, the beauty of the unbroken curve between the edge of the lip and the bottom of the foot is the result of a full century of continued study, a fact that might well cause one to pause and reflect in this age of mad hurry.

The "Kylix" derives its name from the fact that it was turned in the lathe and both the form and the name of that most sacred of ecclesiastical vessels, the "Chalice," is derived from this ancient Greek Cup. During the Middle Ages, the Chalice gradually assumed the deep cup shaped body and tall stem, as now made. The fine old Eleventh Century Romanesque golden chalice in filigree work shown as Fig. 5, Plate 3, is an excellent example of this transition period.

Designers and craftsmen for centuries have found a

PLATE 3.

Fig. 1. Early type of Greek "Kylix" in Terra-Cotta, with black painted decoration.

Fig. 2. Ancient Roman cup of silver, shallow bowl type after Greek "Kylix."

Fig. 3. An ancient "Kylix," showing the highest development of this famous Greek Cup.

Fig. 4. A very early type of Greek "Kylix" in bronze.

Fig. 5. Eleventh Century Romanesque Chalice in Gold and Enamel, showing beginning of deeper cup shape body.

Fig. 6. Yachting Trophy in Sterling Silver, designed after Greek "Kylix."

prolific source of inspiration in the simple lines and harmonious proportions of the "Kylix" at its best period of artistic development. The graceful curve of its body and slender footed stem has served as a model for some very beautiful silverware of modern make. The "Vigilant Cup," Fig. 6, Plate 3, is one of the most notable trophies whose design has been inspired by the form of the "Kylix." This cup has been conceded to be one of the finest examples of 19th Century American Silversmithing. As may be noted from the illustration, the body is patterned after the deep bowl type with elongated handles and lower foot.

Another perhaps equally famous drinking vessel of ancient times is the Greek "Kanthyros" or Cantharus as it is often spelled, a name believed to have been derived from the resemblance of the earliest types to the beetle, Cantharides. Next to the Kylix the Kanthyros is conceded to be the most perfect form of drinking vessel developed by the Athenian potters. This beautiful deep bowl-shaped cup was held in high favor by the Romans who dedicated the "Kanthyros" to their most favored god Bacchus. This was the style of the cups from which were drunk the toasts during the great feasts for which the Romans were famous, and it is in fact the forerunner of the modern loving cup, a vessel less popular now than formerly.

In the earlier Greek types the body of the "Kanthyros" was that of a deep, slightly rounded bottom bowl with gently tapered sides finished off with a heavy edge or lip, two simple loop handles with a broad thumb-piece at the top and a low moulded base or foot, as illustrated in Fig. 8, Plate 4. Passing through a middle stage of development when the body became deeper and coniform with two large vertical handles and stem base, Fig. 10, Plate 4, it arrives at its most elaborate period of development by the Romans, whose love for elaborate embellishment is nowhere better shown than in their silver and gold wine cups. In this latter period the body is necked-in toward the top, which terminates in a broad heavy edge. The two vertical loop handles formed of a grape vine project well out from the cup and extend about two-thirds the way down the body. The base or foot becomes taller and of more slender proportions, as pictured in Fig. 9, Plate 4, a Kanthyros representing the finest period in Roman Silversmithing.

The decorative features of the Greek Kanthyros when made in metal usually consisted of some such simple motif as the Olive Branch, symbolic of peace and good will, but the Roman cups from the very earliest types were elaborately embellished with symbolic figures in great variety. Fig. 8, Plate 4, illustrates an example of this type of decoration on Roman Kanthari of the Alexandrian period. On the ground are Bacchic emblems, while a Bacchus child bearing a Thyrsus staff and adorned with a garland of vine leaves sits astride a panther, a cupid standing behind him on the animal holds a parasol over the head of the young God, while another cupid in front of the animal pulls at the end of a vine-stock wound about the body of the panther; a third cupid seizes the tail and two masks upon columns separate this scene from a similar scene on the reverse side. Another popular decorative motif with the Romans was the stork which had a prominent place in the myths of these ancient people, so it was but natural that this bird should be used as a decorative motif. Fig. 10, Plate 4, illustrates an ancient Roman cup of silver decorated with storks in high relief. During the later period in Roman art the decorative features of these wine cups became ever more elaborate, every inch of surface being covered with ornament consisting principally of Bacchic attributes, the grape vine, ivy, thyrus staff, masks, dancing satyrs and Centaurs interwoven with scroll work. With the Romans luxury became degeneracy and this spirit of extravagance which ultimately led to their downfall was manifest in the elaborateness of their gold and silver vessels. Some of the Roman cups were so encrusted with precious stones as to cause Pliny to complain, "We drink from a mass of jewels."

The graceful form of the Kanthyros, like the Kylix has been a source of inspiration for the silversmith for centuries past; some of the most admired cup forms are based on the beautiful proportions of this ancient vessel. Fig. 11, Plate 4, pictures a Sterling silver Yachting Trophy of particularly handsome design. Its general form is that of a Roman Kanthyros of the late period as shown in Fig. 9, Plate 4.

The next article of the series will describe the development of the cup forms during the middle ages and the Renaissance.

PLATE 4.

Fig. 7. Very early type of Greek "Kanthyros" in Terra-Cotta, with black painted decoration.

Fig. 8. Early low type of Roman "Kanthyros" in Silver elaborately decorated with animal and cupid motifs.

Fig. 9. Roman "Kanthyros" in silver, with Bacchanalian decoration, from Hildesheim treasure.

Fig. 10. Ancient Roman Cup in silver, with stork decoration.

Fig. 11. Yachting Trophy in Sterling Silver, design based on Roman Kanthyros form.

# Electro-Plating in Japan

## A Description of the Electro-Plating Trade as Carried on in Japan. From Monthly Review of the American Electro-Platers' Society.

By A. P. MUNNING II

Those who wish to present properly the status or condition of a particular industry in a foreign land and to follow the progress which has been made in that field within a reasonable period, must first revert to the causes for the establishment of such enterprise to trace the influences which have affected the development of the business up to the present time.

In the United States it is acknowledged that the manufacture of automobiles represents the greatest single application of plating and polishing. In Japan, on the other hand, bicycles and rickshaws create the biggest demand for electro-plating work. Aside from the manufacture of these, which are the business barometers in the metal-finishing field, most of the other work is produced in so-called job shops, where quantity and diversified production can reduce the overhead costs.

Modern plating plants in Japan are not noticeably different from those in the United States or England. Some distinguishing features, however, are obvious. Steam is seldom used to heat cleaning or plating baths. The cleaning pots, which are actually large cast-iron rice kettles, are heated by direct flame. Plating solutions are warmed by a little stove which is submerged in the tank except for the smoke stack, and fed with coal or coke through a small door cut into the tank on one end. Very little accurate temperature control is exercised in any case. Only a few cyanide copper or zinc solutions are used, for the platers believe, generally, that acid solutions are far more serviceable and less hazardous.

Notwithstanding this seemingly antiquated practice, agitated solutions, plating barrels, parallel type rheostats for tanks, and many other up-to-date agencies are employed.

With more than sixty-million inhabitants in a territory about two-thirds the size of the United States, it stands to reason that little attempt is made to install labor-saving devices, or other high-priced machinery.

The Japanese have, with slight alteration, adopted foreign names for plating materials. For instance, they speak of tripoli as toripili, of buffs as bafu, etc., and this fact has contributed largely to the rapidity with which they have been able to keep astride of the latest changes and improvements. In addition to this, they have organized electro-plating societies which convene monthly in the larger cities, and to which even the least important delver in the profession feels it is his obligation to belong. Groups of these smaller platers further unite themselves into a co-operative society.

Within the past few years the Japanese Government has taken an interest in the furtherance of the science of electro-plating and has granted several loans and concessions to private enterprises which make it a point to report the progress of their work and to put to test new ideas as they are brought forward. This is in accord with the Government's ideas to effect industrial independence and preparedness.

It is interesting to note also that the Japanese have initiated plans to establish a branch of the American Electro-Chemical Society at the Engineering College of the Imperial University in Tokyo, under the direction of Professor Yoshikiyo Oshima, to discuss the transactions of the Mother Society in America and to encourage the presentation of papers of their own.

Custom plays a big part in the habits of the people and they are not readily swayed or converted from long established practice. Indisputable facts and convictions which have so often been responsible for the complete revamping of comparatively modern plants in America, are not sufficient to warrant even the slightest deviation from tried and true methods in Japan.

The desires of the native Oriental are the direct antithesis of Western taste. This can be ascribed to the history of the race, treating of their long seclusion, the religious inclinations, and to their inborn militaristic temperament. Anything glitteringly ostentatious, such as personal decorations, private possessions or even the fittings of shrines and temples, makes a strong appeal to them. They have a penchant, therefore, for gilded objects, oxidized silvers and lacquer wares, black nickel and other finishes which can be effectively produced on objects of unusual design.

Laquer work undoubtedly occupies a premier place in the various branches of the Japanese art industry, and so widespread is the fame of the varnish or laquer employed that "japanned" or "to japan" has long since been current in the English language.

To a foreigner, it is peculiar to see ordinary cheap nickleplated soap boxes coated on the inside with a plate of gold. The Japanese, however, who buys these necessities in the bric-a-brac shops would turn away if the interior of the boxes were not so adorned, for it is conventional of the country that the inside of things must be more excellent than the outside.

Chromium plating is also commanding great concern on the Island, and there is actually more interest taken in its possibilities and further uses than was manifested in the United States early in 1926. At the present time there is a greater demand for chromium plated jewelry in Japan than for any of the precious metals. Many prominent people are wearing chromium plated watches, spectacles, and rings; and the Emperor is having the service ware of the Imperial Household done in chromium for the Inauguration ceremonies in Kyoto.

Considered collectively, the Japanese people are industrious, but their capacity for volume production is small. Contrasted with the cost of skilled labor in the United States, the average wage of a Japanese shop foreman is perhaps, at maximum, one-eighth, or Y3.00 per day, the equivalent of $1.50 gold. This is greater than is found in most European countries, including some parts of Great Britain.

Generally speaking, electro plating in Japan is a comparatively young industry. Unlike its sister industry in America, it has not yet come into its own, nor is it to be supposed that it will, for some time to come, achieve the same prominence, because the Japanese have neither the production nor the funds to enable them to continuously carry on investigations and researches for their practical and truly scientific value. They will, however, continue to follow closely and imitate the methods pursued in the West with a view of some day bidding for a place in the world's markets and disposing of their wares, which, through imitative faculty, craftsmanship and a highly developed sense of the beautiful, they will elevate to an unusually high degree of artistic excellence.

# Spotting Out

## Progress Report—The Research on the Spotting-Out of Sulfide Finishes

By W. P. BARROWS
Research Associate of the American Electro-platers' Society at the Bureau of Standards

### I. INTRODUCTION

During the past two years the American Electro-platers' Society has collected a Research Fund, based principally upon three-year subscriptions, usually of $50 per annum, from manufacturers and from branches of the Electro-platers' Society. Up to date about $7,000 has been collected, of which about $2,500 was received from manufacturers of builders' hardware for the specific purpose of studying "spotting-out." This problem was therefore undertaken first. As funds permit, other phases of electro-plating will be investigated.

The studying of spotting-out was started on January 15, 1927, by W. P. Barrows, formerly a member of the Bureau staff. Visits were made to numerous plants during February, April and August, and information and samples were obtained. Laboratory studies have been conducted upon the causes and remedies of one type of this defect. This report is a brief summary of the principal facts and conclusions thus far derived from this investigation. The facts are definite, at least for the conditions employed; but the conclusions are necessarily tentative, as new facts that may be subsequently learned in the laboratory or plant may modify these conclusions. Pending further work that is in progress, no definite recommendations are warranted.

### II. TYPES OF SPOTTING-OUT

At least two types of spotting-out may be distinguished. The first kind, which will be referred to as "crystal spots," occurs on "oxidized," or more strictly speaking "sulfide" finishes. These spots have a "dendritic" (tree-like) structure, that is easily recognized, especially with a lens or microscope. These form the principal subject of this report. The other type may be referred to as "stain spots," as they consist of irregular discolored areas, that are most likely to be formed on cast metals. These will be studied later.

### III. FORMATION OF CRYSTAL SPOTS

In order to obtain definite and reproducible data on the factors involved in the formation of these spots, methods of accelerating the spotting-out were first developed. In general these involved the storage of the specimens in a confined space (usually a glass desiccator) in the presence of some accelerating agent such as sulfur, rubber, or certain types of paper. By placing in the same vessel samples that had been subjected to different treatments, and noting the time required for spots to appear, the effects of such factors as cleaning, plating, rinsing, coloring and lacquering, were determined. By varying the atmosphere in the different desiccators, the effects of storage conditions could be compared.

The time required for the appearance of crystal spots that could be detected with the unaided eye, varied greatly in different experiments, but was roughly reproducible. Thus under the most accelerated conditions, e.g., with sulfur or rubber present, such spots were observable in from one to three days. Conditions less favorable for spotting, such as in the presence of certain papers, caused the spots to appear in from one to four weeks. Whenever it is stated that no spotting occurred, this means that no spots could be detected in periods from three to six months.

The first appearance of spots was no necessary indication that the samples then had such an unsatisfactory surface as to be objectionable commercially. The rate at which the spots increased both in size and number determined the time when they could be classed as commercially unacceptable.

The experiments thus far conducted have yielded the following facts and tentative conclusions:

(1) Crystal spots occur only on finishes that contain sulfur, such as the "oxidized" finishes on copper or brass; and the black nickel finish containing sulfur.

(2) These spots do not appear on bright or relieved parts of the copper or brass unless some sulfide is still present, e.g., if it has been incompletely relieved.

(3) Crystal spots appear only on sulfide finishes that have been lacquered. Unlacquered specimens may tarnish, but do not spot out.

(4) Sulfide finishes on surfaces plated with copper or brass, show just the same tendency to spot out as those produced directly on solid copper or brass.

(5) The composition of the base metal beneath the plated surface has no effect on the tendency to form crystal spots. (The rusting of a steel base through pores in a plated coating, represents a form of stain spots, and should not be confused with the crystal spots.)

(6) The alkaline cleaners, acid dips, plating solutions, or coloring solutions used in preparing the finish, have no necessary relation to crystal spots. These also form as readily on copper that has been "oxidized" with hydrogen sulfide, without coming in contact with any liquid except water.

(7) Powdered sulfur, and rubber such as rubber bands which contain free sulfur, when in contact with the lacquered, "oxidized" metal, markedly accelerate crystal spotting. This is a convenient method of producing such spots. Sulfur vapor accelerates the spotting, approximately in proportion to its concentration. Hydrogen sulfide also accelerates the spotting, but less so than does free sulphur. Sulfur dioxide does not produce spots, but causes etching and tarnishing, especially at high humidities.

(8) Some kinds of paper used for wrapping undoubtedly accelerate the spotting, but to a less degree than do sulfur or hydrogen sulfide. Experiments are in progress to determine whether the effects of such papers are due to their possible sulfur content or to physical properties such as permeability.

(9) Variation of the humidity from zero to 90 per cent in the desiccators, had little effect upon the accelerating action of sulfur on spotting out. Further studies will be needed to fully explain the fact that more spotting out is observed in the plants in the hot, humid months.

(10) Sulfide finishes exhibit a definite, but less marked, tendency to spot out even in the absence of external sulfur or other accelerating agencies. At ordinary temperature (70° to 90° F.) this tendency of the finishes to spot out of themselves is less at high humidities (90 per cent) than at moderate humidities (50 to 70 per cent).

(11) The presence of air is apparently necessary for the production of these crystal spots. Specimens in a vacuum in close contact with sulfur, showed no such spots, though the sulfur attacked the finish where the lac-

quer was scratched or broken. Presumably the oxygen of the air is the active constituent in causing the crystal spots. It is well known that lacquer coatings are not impervious to oxygen or other gases.

(12) If both sulfur and oxygen are necessary for the crystal spots, it is not surprising that they may form when no other external accelerating agent such as sulfur is present; as the coating contains the sulfur, and the air may pass through the lacquer.

(13) Sulfide finishes with several coats of lacquer show some decreased tendency toward spotting, but the improvement is hardly sufficient to warrant the increased expense.

(14) Efforts were made to decrease the spotting-out by preparing lacquers containing such oils as bodied linseed, tung, fish and mineral oils. Lacquers containing bodied linseed oil greatly decrease the tendency toward spotting-out, but unfortunately they increase the tendency of the finish to tarnish, especially at high humidities. Their use cannot therefore be recommended.

### IV. POSSIBLE REMEDIES

From the above facts it appears that it may be possible to prevent or at least reduce the tendency for crystal spotting, by (a) excluding sulfur from the finish itself; (b) excluding sulfur or injurious sulfur compounds from the surroundings; and (c) excluding air or oxygen from the finish. Of these, (a) would involve changes in manufacturing processes, which, while possible, might involve great expense and delay. Remedy (b) may be accomplished by keeping the articles during manufacture, storage and transportation, away from sulfur, hydrogen sulfide, rubber, or other materials that may yield sulfur or volatile sulfides. Course (c) might be carried out by treating the surface so as to produce a film more impervious to air than the lacquer film. Experiments that are now in progress indicate that if even a very thin film of a grease such as petrolatum is applied to the lacquered surface the tendency to crystal spotting is decreased.

### V. FUTURE PLANS

Further experiments will be conducted in the laboratory to check the above conclusions, and especially the feasibility and value of various possible remedies. Arrangements will then be made for a number of plants to try under commercial conditions the most promising procedures. It will therefore be at least a few months before definite recommendations can be made.

As soon as feasible a study of the stain spots will be undertaken.

## Aluminum for Washing Machines

Q.—We use 20 gauge aluminum in the basket or spinner of washer. This basket or spinner travels at the rate of 1020 RPM, is conical shaped, being 17″ high, 8½″ diameter bottom, 10″ at the top and by a centrifugal action throws the water from the clothes and dries them moist dry. This dryer or basker is drawn from one piece of aluminum with no perforations. In a recent conversation with the former sales manager, I believe, of a washing machine corporation, he advised that they used a perforated aluminum basket several years ago and it seems their basket decreased 2 lbs. in weight per year by oxidation.

Whether this gentleman knew what he was talking about is beyond me but it has concerned me considerably and I would like to have a report advising whether by oxidation this aluminum basket will decrease in weight and whether eventually we are going to have a lot of difficulty and trouble by using the aluminum basket.

A.—The most practical remedy for your trouble would be the nickel plating of the baskets in question. This can no doubt be done locally, but extreme care should be taken to see that there are no pinholes in the nickel plating, as otherwise, it would be an accelerant, rather than a retarder of corrosion.

It is the free alkali of the soap that undoubtedly causes the loss of weight of the baskets rather than oxidation. It would probably be impossible to caution users to employ soap containing no free alkali, but caution could be observed in regard to the addition of free alkali to render the washing more rapid.

The Bureau of Standards has successfully chromium-plated aluminum alloy parts of hydroplanes as a protection against corrosion by sea-water, but as you are aware, chromium plating is not as generally practiced as nickel plating, and it would be no more efficient as a protection against corrosion by alkali than nickel plating.

Possibly a better and cheaper solution of the above difficulty would be to advise you to obtain a hard rolled sheet magnesium for use in the drier mentioned. Magnesium would be lighter than aluminum and would withstand the alkali corrosion.—JESSE L. JONES.

## Structural Aluminum Alloys

Bars of new aluminum alloys, stiffer and stronger than steel, were demonstrated by Dr. Zay Jeffries, consulting metallurgist, of Cleveland, Ohio, before the New York Electrical Society in the Engineering Auditorium, 29 West 39th Street, New York City, on the evening of November 17, 1927. When arranged as miniature cantilever structures like those sometimes used in building bridges or skyscrapers, the bar of the new alloy sunk under a given load only 1/7th as much as a bar of standard steel of the same weight and width.

How the crystals of hard materials exist inside beams and rods of the new strong alloys to provide their strength, was illustrated by photographs of the internal metal structure taken through microscopes. Many metals seem soft, Dr. Jeffries explained, because the arrangement of the atoms permits planes of metal to slip over each other like cards of a deck. The hard crystal grains operate like sand between the cards, to prevent slippage.

A great expense of modern industry is, Dr. Jeffries said, the cost of moving weight. A railroad train or a street car must not only move the weight of its passengers; it must also move its own weight. Use of the new strong alloys is a revolutionary feature of the present tendency in transportation.

Metals of similar type are already much used for aircraft. Duralumin, developed originally in Germany, is merely one of several alloys which has the combination of great strength and lightness. The airplane propeller used by Col. Lindbergh on his epoch-making flight between New York and Paris, was constructed with blades forged from one of the new alloys.

The value of extreme purity in metals was illustrated by Dr. Jeffries' announcement of a new method of protecting some of the strong light weight metals against attack by salt water. Modern engineers, especially in the aircraft industry, call for the maximum of resistance to corrosion. To meet this demand, American metallurgists, notably the experts of the United States Bureau of Standards, and E. H. Dix of New Kensington, Pa., have perfected methods of coating the strong light weight alloys with a thin surface layer of almost pure aluminum. This layer protects the alloy against attack.

# Chromium Plating Patents

## An Abstract of a Study of Patents Dealing with the Electrodeposition of Chromium*

By RICHARD SCHNEIDEWIND

The patent situation in the United States, as well as in Europe, has very considerably retarded the development and general adoption of chromium plating as a means of improving the appearance and utility of metallic articles. Many large manufacturers although they have felt that public taste was turning towards this bluish metal which has such a remarkable resistance to tarnish have hesitated to apply it to their products. Many articles subject to wear which could have been improved by having this hard, brilliant, smooth, almost frictionless coating of metallic chromium deposited on their surfaces, have not been so treated because of the fear of royalty and patent suits. The patent situation has also greatly discouraged shop research in chromium plating. The installation of equipment of a practical size with which the shop plater can experiment more or less scientifically according to his own bent usually does not, to be sure, result in the discovery of fundamentally new ideas but it generally does develop technique to a high degree. In the process of depositing chromium the development of technique is the most needed factor, since good plating baths have been known for many years. Much of the benefit which might have come from experience in the shop has thus been lost because of the confusion in the patent situation and the impression that chromium plating was apparently a patented process controlled by a few corporations.

The fact is that from time to time various groups possessing patents have combined, until at the present time practically all important chromium plating patents are controlled by two or three large corporations. Each new merger has deepened the general impression that the process of electrodeposition of chromium was gradually becoming a completely patent-controlled process and that no plating could be done without a license from some one of these large corporations.

The study of the patent situation which forms the subject of the present bulletin was made at the University of Michigan under the direction of the Department of Engineering Research with a view to determining the extent to which the process of the electrodeposition of chromium is actually controlled by patents. It was hoped that such a study might clear away some of the misapprehensions and misunderstandings regarding the degree to which the process of chromium plating is limited by the present patents and thus open the way to its wider application and use.

### OBJECT OF THE BULLETIN

This study of the patent literature dealing with the electrodeposition of metallic chromium, and more particularly with the electrodeposition of chromium from chromic-acid baths was conducted with the following objectives in view:

1. To assemble all available information on chromium plating which is revealed in patents, and has not been published in the scientific literature.

2. To construct, from patent sources, an historical sketch of the development of modern commercial chromium-plating baths, of methods of plating, and of special technique. This account will need to be supplemented by the record of the history of chromium plating as derived from the published scientific literature, in order to give a true picture of the development of this industry. This fuller study will be presented in a subsequent bulletin in this series.

3. To weigh the merits of the claims of different patents on the basis of their scientific or commercial worth.

4. To arrive at some conclusion as to the relative legal value of the patents. It is understood that no opinion can take the place of a court decision; yet the information and conclusions set forth from the angle of the technical worker in the field should have considerable value.

### SUMMARY

The study of the patent literature on chromium plating from chromic-acid solutions may be briefly summarized as follows:

1. Very little important information has been disclosed in the patent literature which is not antedated by information published in the scientific literature.

2. Although good fundamental research on chromium plating was done by Carveth and Curry (A)[1] in 1905, it resulted in no immediate commercial interest. Their solution, however, is a usable one. Commercial chromium plating probably began on a small scale in Germany as a result of patents granted to Salzer (18, 19) in 1907 and in 1909. Due to factors of which he was unaware, his solutions did not give uniformly good results.

Baum (20) was granted a patent in England in 1913 for a process of making chromium-plated filament holders for electric lights. This filament holder aroused no enthusiasm and so his method of plating, incidental to the process, was forgotten. His bath, however, was a good one; the formula published in the specifications of the patent, was not claimed.

The first good bath that awoke commercial interest was fully described by Sargent (B) in 1920. This bath is essentially the bath used most generally at the present time. A year later Grube (27), a German, applied for a patent on a solution assentially the same as Sargent's. In the years immediately following chromium plating developed rapidly on a commercial scale. Although much interest has been aroused and many patents have been taken out, nothing new of a very fundamental nature has subsequently been developed. In fact, most modern baths, although they may have been prepared in different ways, will prove, when subjected to a chemical analysis, to have almost identical components in almost identical relative proportions.

3. The relative merits of the baths and of the plating methods are discussed along with the detailed description of each patent. Inasmuch as so many of the solutions upon analysis prove to be nearly alike, it is almost self-evident that, with slight modifications, they will give very similar results. This intimate relationship existing among these solutions is made evident by the table below.

4. In the writer's opinion, it is doubtful whether there is any patent or group of patents which can control the

* Engineering Research Bulletin, No. 8. November, 1927. Department of Engineering Research, University of Michigan, Ann Arbor, Mich. Complete copies of this Bulletin containing a Patent Bibliography can be obtained from the above Department for 50c. Another Bulletin on the same subject is to be issued in the near future.

[1] See Patent Bibliography, pp. 29-49. The figures and letters after the names refer to the number of the reference in the bibliography.

process of electrodeposition of metallic chromium from chromic acid baths. Only a court decision, however, can make this opinion an established fact. Yet, a study of the published (not patented) researches of Carveth and Curry (A), and of Sargent (B), and a study of the expired patents of Salzer (18, 19) and Baum (20) will prove very enlightening, and will show that most later patents are mere restatements of known facts and that such refinements and modifications of known processes as are revealed in some of them are not essential to the process.

CHROMIC ACID PLATING BATHS CLAIMED BY INVENTORS

I. Chromic Acid + Sulphate Radical

(a) Simple Baths

| | | | |
|---|---|---|---|
| Placet and Bonnet?. | (3,8) | 1890 | $CrO_3 + H_2SO_4$ |
| Carveth and Curry*.. | (A) | 1905 | $CrO_3 + H_2SO_4$ |
| Sargent* ..... | (B) | 1920 | $CrO_3 + Cr_2(SO_4)_3$ |
| Fink and Eldridge* (not claimed)..... | (50) | 1924 | $CrO_3 + Cr_2(SO_4)_3$ |
| Appel* ..... | (62) | 1925 | $CrO_3 + Na_2SO_4$ |
| Warker* ..... | (63) | 1925 | $CrO_3 + CuSO_4$ |
| Fink* ..... | (65) | 1925 | $CrO_3$ + all sulphates |

(b) Simple Baths + Chromium Hydroxide

| | | | |
|---|---|---|---|
| Salzer* ..... | (18) | 1907 | $CrO_3, Cr(OH)_3 + H_2SO_4$ |
| Salzer? ..... | (19) | 1909 | $CrO_3, Cr(OH)_3 + Cr_2(SO_4)_3$ |
| Grube* ..... | (27) | 1921 | $CrO_3, Cr(OH)_3 + Cr_2(SO_4)_3$ |
| Liebreich* ..... | (28) | 1921 | $CrO_3, Cr_2O_3 + H_2SO_4$ |
| Pierce and Humphries* | (38) | 1924 | $CrO_3 + Cr_2(SO_4)_3 + NH_4OH$ (forms $Cr(OH)_3$) |
| Hosdowich* ..... | (60) | 1925 | $CrO_3 + Cr(OH)_3 + FeSO_4$ |
| Long et al*..... | (59) | 1925 | $CrO_3 + Cr_2(SO_4)_3 + CuCO_3$ (acts like $Cr(OH)_3$) |

II. Chromic Acid + Borate Radical

| | | | |
|---|---|---|---|
| Placet and Bonnet?. | (3, 8) | 1890 | $CrO_3 + H_3BO_3$ |
| Baum* (not claimed). | (20) | 1912 | $CrO_3 + H_3BO_3$ |
| Fink* ..... | (66) | 1925 | $CrO_3$ + all borates |

III. Chromic Acid + Borate and Sulphate Radicals

| | | | |
|---|---|---|---|
| Baum? (not claimed). | (20) | 1912 | $CrO_3 + H_3BO_3 + Cr_2(SO_4)_3$ |
| Suzuki? ..... | (53) | 1925 | $CrO_3 + H_3BO_3 + Cr_2(SO_4)_3$ |
| General Motors Corp.* | (41) | 1924 | $CrO_3 + H_3BO_3 + Cr_2(SO_4)_3$ |
| Fink* ..... | (65) | 1925 | $CrO_3$ + mixtures of stable radicals i. e. sulphates and borates |

IV. Chromic Acid + Fluoride Radical

| | | | |
|---|---|---|---|
| Hambuechen? ..... | (45) | 1924 | $CrO_3 + Na_2F_2$ |
| Fink* ..... | (65) | 1925 | $CrO_3$ + all fluorides |

V. Chromic Acid + Miscellaneous Radicals

| | | | |
|---|---|---|---|
| Grah? ..... | (34) | 1923 | $CrO_3$ + HCl or $CH_3COOH$ |
| Hahn* ..... | (49) | 1924 | $CrO_3 + H_2O_2$ + a Cr salt |
| LeBris* ..... | (52) | 1924 | $CrO_3 + Cr_2O_3$ + oxidizing salt or acid |
| Fink* ..... | (65) | 1925 | $CrO_3$ + all stable acid radicals |

* Baths satisfactory as described.
? Baths not functioning properly. In some cases this is due to the amount of substances prescribed and not to the nature of the materials.

PLAN OF PRESENTATION

In the compilation of a patent digest somewhat different factors are involved than in the compilation of an ordinary bibliography. The true meaning in a patent may be obscured by words which were meant to cover general cases as well as specific ones, or the information may be fragmentary, or a man stumbling upon a workable process may make false statements due to his uncertain grasp of technical details or due to his lack of scientific knowledge. The exact time of the application for the patent is also of extreme importance. All of these details require different treatment than would a mere abstract of the patent claim. Hence, in order that the information may be presented clearly and completely the following general form has been used:

First, a fairly complete history of the development of the art of chromium plating as it is evidenced in the patents is presented. References to the scientific literature have been avoided wherever it was possible and yet be fair and just in giving credit.

Second, the patents of primary importance have been grouped and classified for the purpose of discussion. Comments on these have been based upon a knowledge of chemistry, upon a knowledge of antedating revelations, and upon original experimental work.

The third section of the bulletin contains the patent bibliography proper. In this each patent is abstracted and commented on. Special care was taken not only to give the date upon which the patent was issued, but also to give the actual date of application. If the patent was originally taken out in a foreign country, the convention date (date of application in that foreign country) is given.

THE DEVELOPMENT OF COMMERCIAL CHROMIUM PLATING

It is not always possible to separate entirely the scientific literature from the patent literature on a given subject since being so closely related, the two together alone will reveal the whole story of the development of the subject. In the present discussion of chromium plating patents, however, it has been necessary to mention only two of the widely known fundamental researches.

The earliest patent in the field of electrodeposition of metallic chromium was granted by the British Patent Office to Junot (1) in 1852. As a bath he used,

"chromium dissolved in a double chloride of soda and ammonia in the proportion of about one hundred grams of metal to one kilogram of the salt dissolved in ten liters of water."

The solution was maintained in wooden tanks at a temperature of from 30° to 40°C. The anodes were of platinum. It is very doubtful whether the resulting deposit was abundant or of such quality as to be commercially valuable.

In 1890 and for a few years following, Placet and Bonnet (3, 4, 5, 6, 7, 8, 10) took out a series of patents covering the electrodeposition of chromium from baths of many compositions and concentrations. Unfortunately, owing to their desire to make their patents very broad and fundamental in nature, they neglected to give some of the necessary specific directions for plating. This resulted in a controversy over the merits of their solutions and even over the inventors' veracity. LeBlanc,[2] for example, one of the outstanding electrochemists of the time, raised doubts as to whether the specimen of metallic chromium exhibited to the Academy of Sciences in Paris had actually been electrodeposited as represented. Subsequent research, however, has proven that when used under the proper conditions the chromic acid baths of Placet and Bonnet will yield bright metallic chromium. It is possible that the relative impurity of commercial chemicals at that time was responsible in part for the confusion arising in the attempts to duplicate their work.

It may be interesting to note, as an example of the foresight of these early investigators, that Cowper-Coles and Hickley (11) were granted a patent in England in 1895 on the use of electrodeposited chromium as a nontarnishable surface for searchlight reflectors.

In 1905 Carveth and Curry (A) published the results of a successful research on the deposition of chromium from a bath containing chromic acid and sulphuric acid.

Subsequent to an article published the same year by Carveth and Mott on the deposition of chromium from baths of trivalent and divalent chromium, most research has been devoted to the use of chromic-acid baths.

Although the work of Carveth and Curry showed the possibilities of chromium, and also a thoroughly workable process of obtaining good deposits, their researches did not arouse any commercial interest at the time.

The first ambitious attempts to put chromium plating on

[2] M. LeBlanc. The Production of Chromium and its Compounds by the Aid of Electric Current. Book, 32 pages, 1904.

a commercial basis resulted in a German patent application by Salzer (18) in 1907. As a bath, he used chemical equivalents of chromic acid, $CrO_3$, and "chromoxid," $Cr_2O_3$, to form chromium chromate. He advised using an excess of chromoxid and small amounts of acids such as sulphuric. This bath did not always give good results. Work done at the University of Michigan by the present investigator has shown that the success of this bath was not due to the addition of chromoxid to chromic acid, but was due entirely to the presence of sulphate or similar ion which was there either as an impurity or was deliberately added to the bath. Two years later, in 1909 Salzer (19) applied for another patent in which he added chromium sulphate to his old bath.

Baum (20), an electrical engineer, applied for a British patent in 1912 for "a method for the production of filament holders for metal filament electric incandescent lamps." He was desirous of producing a chromium-plated nickel wire. The Chromium could be deposited as metal, hydroxide, or a mixture of the two because of the subsequent annealing operations in hydrogen to which he subjected the wire. His primary interest was in the manufacture of this electrical contrivance and not in the electrodeposition of chromium. Perhaps for this reason he did not include the plating process in his claims but merely mentioned them in the specifications. The directions read as follows:

"The wire is then placed in a chromium both which consists of a 10-per-cent solution of chromic acid to which from 0.5 per cent to 1.0 per cent of a suitable acid, for example, boric acid, tartaric acid, or the like, is added. When too high curent densities are not to be used, the wire is placed in a bath of 10-per-cent chromic acid, $CrO_3$, and 10-per-cent chromic sulphate, $Cr_2(SO_4)_3$, to which boric acid or the like may be added.

"If the operation is carried out within determined limits of current, deposits varying from pure metal to chromous hydroxide, $Cr(OH)_2$, are obtained according to the intensity and pressure."

This first bath, especially when made up with ordinary tap water, can always be relied upon to produce good plate. In this respect it cannot be said to infringe upon Placet and Bonnet (3, 8), since their descriptions of a similar solution are so vague that its use may give erratic results.

Little developmental work was done during the war. In 1919 Liebreich (22) applied for a German patent for a scheme to protect the inner surfaces of boiler tubes, preheater tubes, and similar objects. He suggested plating them by using a chromic-acid solution and an anode of some metal such as iron, nickel, cobalt, etc. In this manner an alloy of chromium and the other metal was supposed to be formed. It is extremely doubtful, however, whether an alloy can be produced in this manner; nearly pure chromium would undoubtedly be deposited instead.

Sargent (B) published the results of his researches on the electrodeposition of metallic chromium in 1920. His paper marks the beginning of commercial chromium plating in the United States. He was fully in touch with the results of Carveth and Curry (A) who had done their work at the same institution. Instead of using chromic acid and sulphuric acid, however, he worked with a large series of solutions containing chromic acid and chromium sulphate. He demonstrated the commercial practicability of chromium plating and gave detailed instructions on the obtaining of satisfactory deposits.

A year later Grube (27) applied for patents on a solution of chromic acid and chromium sulphate to which a small amount of chromium hydroxide was added.

At the same time Liebreich (23, 24, 28, 29, 46, 48) took out the first of a large number of patents on chromic-acid baths containing trivalent chromium. Evidently he was attempting to introduce refinements into the rather uncertain methods of Salzer. The success he may have had with the solutions described in his earlier patents must have been due to the presence of sulphate ion as an impurity, a point he overlooked until he took out a later patent. In this, the sulphate impurity is specifically mentioned. Liebreich, however, must be given credit for having made a very careful study of the mechanism of the electrodeposition of metallic chromium from chromic-acid plating baths.

Actually the story of the development of the chromic-acid bath ends here. Numerous patents have been granted in which to chromic acid is added ammonium sulphate (38), sodium sulphate (62), iron sulphate (60), or innumerable other sulphates (63, 65). Sodium fluoride (45), various borates (20), chlorides (34), and acetates (34) have also been suggested as addition agents.

Fink and Eldridge (50) in 1924 applied for a patent in which they described the successful use of Sargent's bath: their English patent was granted; their American patent application was refused. Almost two years later Fink (65) applied for and was later granted a patent which not only covers the Sargent bath but which purports to be fundamental. In this patent there is an admirable enunciation of a theory of chromium plating and also a summary of favorable plating conditions. Fink in his statement that it is simply the sulphate ion, or similar ion, along with the chromic acid which make up the necessary constituents of a good bath was the first to organize or generalize previously known facts. By a good bath is meant a bath which will produce good deposits of chromium over a fairly wide range of conditions.

To sum up the whole situation, good chromium deposits are obtainable through the use of the solutions of Carveth and Curry (A), Baum (20), or Sargent (B). The chemical analysis of a Sargent bath will be found identical in all essentials with that of any good bath patented subsequently. No good baths patented previous to Sargent's work are in general use today. The Chromium plating industry is greatly indebted to the controllers of chromium plating patents, not for the development of the art, but rather for the dissemination of necessary knowledge on the limitations of chromium plating, and on control of plating conditions which heretofore was beyond the grasp of the average plater. Control of temperature, control of current density, control of bath concentrations, the venting of fumes,—these and many other important factors necessary to successful electrodeposition of chromium have been introduced by the agents of large plating corporations to the shops of their licensees. To obtain a deposit of chromium is relatively easy but to obtain this day after day and keep up the standards of quality on all types of work, is a matter requiring a great deal of effort and skill. Successful plating with chromium, then, is not so much a matter of the type of bath used as a matter of careful control of the conditions of plating.

### A DISCUSSION OF SOME OUTSTANDING PATENTS

The work done by the present investigator at the University of Michigan has established or substantiated several points of importance. The first of these is that the only essential constituents of a chromic-acid plating bath are chromic acid and the sulphate or similar ion. The best concentrations were given in an unpublished report to The Detroit Edison Company, dated June, 1927. Secondly, brilliant chromium plate can be obtained from such a solution by plating under certian combinations of conditions of temperature and current density. And thirdly, there is a bath composition which may be regarded as an equilibrium toward which a bath inclines upon use. All this work has been reported to the Detroit Edison Company and will be published in a later bulletin in this series.

As had been stated before, a good plating bath need con-

tain only chromic acid and a stable acid radical. After use, however, such a plating solution upon analysis will invariably show the presence of the trivalent chromium ion. its presence is explained in the following manner: Hexavalent chromium from the chromic acid is reduced at the cathode. A part is separated out as metal, the remainder stays in solution as a trivalent ion and should be reoxidized to the hexavalent form at the anode. However, the anode is not perfectly efficient in the reoxidizing process and hence a concentration of chromium of lower valency remains in solution. The magnitude of this concentration is dependent in part at least upon the following factors:

1. Anode current density,
2. Efficiency of anode material,
3. Temperature of bath, and
4. Composition of bath.

For example, if a bath containing initially only chromic acid and sulphuric acid be used for plating for a period of time, it will be found at the end of that time to contain not only these two compounds but also a certain concentration of trivalent chromium.

If, on the other hand, a solution containing chromic acid, sulphuric acid, and a large amount of trivalent chromium, added as chromium hydroxide, for instance, is used for plating under identical conditions as before, the ionic composition as revealed by a chemical analysis will at the end of this time be very close to the final analysis of the previous bath.

With these points as a background, it is now easier to give due consideration to the various patents.

Up to 1920 there was a wide difference in opinion as to the mechanism of chromium deposition. Although the use of chromic acid with various acids or salts had been specified by Placet and Bonnet (3, 8), Carveth and Curry (A), Baum (20), and Sargent (B); yet Salzer (18, 19), and later Liebreich (23) considered chromium chromate as the essential constituent of a plating bath. This chromium chromate was formed either by partial reduction of chromic acid or by the addition of chromium hydroxide to chromic acid.

Whatever good results Salzer or Liebreich may have obtained were undoubtedly due to sulphate or similar ion present as an impurity or added deliberately.

### SULPHATE BATHS

Placet and Bonnet (3, 8) described a large series of baths containing chromic acid having additions of such acids as phosphoric, sulphuric, benzoic, boric, and many others. It is not possible to place a great deal of weight on the revelations of Placet and Bonnet because of the vagueness of their directions. An expert plater probably would not obtain good chromium deposits by following their specifications without considerable preparatory research work.

Carveth and Curry (A) successfully used chromic and sulphuric acids; Sargent (B) used chromic acid and chromium sulphate. Fink and Eldridge (50) were granted a patent in England (refused in the United States) on the manufacture of printing forms and dyes. In the specifications of this patent they described the successful use of Sargent's bath. Appel (62) used chromic acid and sodium sulphate. It is desired to emphasize especially the fact that neither Carveth and Curry nor Sargent patented the results of their researches. Their interest was purely scientific. On December 10th, 1925, W. Würker (63) went a step farther when he applied for a French patent covering the use of chromic acid and copper sulphate, and stated that salts of heavy metals or alkaline earth metals could be substituted for copper sulphate. On December 19th, 1925, C. G. Fink (65) generalizing more broadly than all others in his application for an American patent covered the use of chromic acid along with all,

"acids and bases having a sulphate radical; acids and bases having a fluoride radical; acids and bases having a phosphate radical; acids and bases having a borate radical."

This last mentioned patent is very comprehensive indeed; so much so that if valid in all of its parts there would be embraced in its claims not only 90 per cent or more of the plating baths of today but also the bath published by Sargent in 1920, the bath described by Baum (20) in 1912, the bath worked out by Carveth and Curry in 1905, and the baths of Placet and Bonnet published in 1890. In fact this patent could be construed to embrace practically every good solution prepared since its publication and also all the workable solutions prepared as much as thirty-five years before its publication.

### BORATE BATHS

The only true borate bath was revealed by Baum (20) in 1912. He used a 10-per-cent solution of chromic acid to which he added 1 per cent of boric acid. The Fink (65) patent of 1925, however, attempts to cover this composition.

### FLUORIDE BATHS

Hambuechen (45) used a metal fluoride in place of the usual sulphate in his chromic-acid solution. The Fink (65) patent, however, attempts to cover the addition of any fluoride to chromic acid.

### BATHS CONTAINING CHROMIUM CHROMATE

Both Salzer (18, 19) and Liebreich (23, 24, 28, 29, 46, 48) believed that chromium chromate was necessary in a chromic-acid bath. It has been shown that chromium chromate is not essential. Good results were due to anions in the bath.

### COMBINATION BATHS

Baum (20) in 1912 and Suzuki (53) in 1925 described and patented almost identical baths containing chromic acid, chromium sulphate, and boric acid. The present writer has found the solubility of chromium sulphate in water to be comparatively low and has not been able to dissolve more than one-tenth as much as is specified in those patents.

The General Motors Corporation (Phillips and Strausser, 41) uses a Sargent's bath to which a small amount of boric acid is added; steel anodes are specified. The effect of this amount of boric acid does not markedly change the characteristics of the bath.

It has been stated before that a bath upon use builds up a certain concentration of trivalent chromium ion. If one were to analyze the supernatant solution of a Salzer (18) bath prepared from chromic acid, "chromoxid," and sulphuric acid, after it has been operating satisfactorily at the prescribed temperature, practically the same result would be obtained as from analyzing a used Sargent bath prepared from chromic acid and chromium sulphate. It is possible to make up a bath so that it would give immediately the same analysis as the "equilibrium analysis" above mentioned. Just such a bath is the one patented by Grube (27) in 1921. He prepared his bath from chromic acid, chromium sulphate, and chromium hydroxide.

The Grube (27) bath is essentially the same as the Sargent bath. Grube's addition of a small amount of chromium hydroxide to the Sargent (B) bath has very little effect. In the first place, it introduces no new, effective anion; because of the large reservoir of chromic acid present, it cannot appreciably change the pH; and lastly, it increases the trivalent chromium-ion concentration but slightly. The additional amount of trivalent

chromium is only that which might normally be obtained upon use in a Sargent bath. The exact "equilibrium concentration" of trivalent chromium is dependent upon plating conditions. The present writer has subsequently found that the presence of trivalent chromium is detrimental rather than beneficial, although, in amounts found in ordinary Sargent (or Grube) baths, it usually does not affect results.

Pierce and Humphries (38) patented a bath prepared by mixing chromic acid, ammonium hydroxide, and chromium sulphate. When mixed, the resulting bath proves to be exactly the some ionically as Grube's (27) except for the presence of a small amount of ammonium ion. It is, then, essentially a Sargent type of bath.

It is hardly necessary to describe the many other baths of this type. For the most part they contain chromic acid, a small amount of chromium hydroxide, and some salt with a fairly stable acid radical, such as sulphate.

There have been some patented baths which when tried out gave very poor results. For instance, the solutions described in the patent to R. Grah (34) and in that to Hambuechen (45) yielded very poor deposits of metal even when the recommended procedure was implicitly followed. One is led to believe that either the statements were not entirely accurate quantitatively or were incomplete.

### ANODES

The anodes used with chromic-acid plating baths are most generally of lead. Platinum was originally used for laboratory experiments, but since as long ago as 1890, (3, 5) lead has been commonly used. It is believed that a surface coating of lead peroxide is formed during electrolysis, which is an effective medium for anodically re-oxidizing chromium ions of lower valence.

Iron also forms a higher oxide which acts similarly to lead peroxide. It is not known exactly when iron or steel anodes were first used, but Wolff (32) in his application March 28, 1923, described their use as "old art."

Wolff (32) advocated the use of chromium anodes. His patent covered the manufacture of anodes by pressing powdered chromium into a desired shape and sintering. The disadvantage of using any chromium anode lies in the fact that according to various writers the trivalent chromium-ion concentration builds up rapidly.

Ferrochromium has also been suggested. Coignard (35) applied for a patent covering ferrochromium anodes in 1923; Schwartz (51), in 1924.

### SPECIAL TECHNIQUE

Most of the special technique in electroplating with chromium is not patentable, and some descriptions of special processes have been published in the scientific literature. There is, however, a German patent to the Verchromungsanlagen-Gesellschafft (55) which deals with bright plate. When a plating operation has been interrupted, it is possible to resume plating at a future time if the piece is first heated at least to the bath temperature. This is best carried out by allowing the piece to hang in the bath for a short time before applying current. Fink (61) applied for a patent in England for the production of bright plate by regulating (a) bath composition, (b) temperature, and (c) current density. This, however, was old art long before this patent was applied for.

### APPLICATIONS

No very far-reaching applications for chromium plate have been patented. Among other things that have been described are devices for cutting glass, chromium-plated commutator bars, tubes, tools, etc.

### RÉSUMÉ

It has been shown that the published, not patented, fundamental researches of Carveth and Curry and of Sargent are sufficient to teach one how to obtain good chromium plate. Sargent's bath with different, slight, unessential modifications is the basis for a large number of patents applied for subsequently. It is believed that many of the patents would be found not only to infringe upon each other but some even to attempt to cover baths published twenty and thirty years previously (63, 65).

In order to summarize the information given a chart is presented in which the various patents are grouped according to similarity of essential constituents.

1. Name of inventor.
2. Number of reference in the patent bibliography.
3. The application or convention date.
4. The essential components of the bath.

CHROMIC ACID PLATING BATHS CLAIMED BY INVENTORS

| | | | |
|---|---|---|---|
| **I. Chromic Acid + Sulphate Radical** | | | |
| **(a) Simple Baths** | | | |
| Placet and Bonnet?. | (3,8) | 1890 | $CrO_3 + H_2SO_4$ |
| Carveth and Curry*. | (A) | 1905 | $CrO_3 + H_2SO_4$ |
| Sargent* | (B) | 1920 | $CrO_3 + Cr_2(SO_4)_3$ |
| Fink and Eldridge* (not claimed) | (50) | 1924 | $CrO_3 + Cr_2(SO_4)_3$ |
| Appel* | (62) | 1925 | $CrO_3 + Na_2SO_4$ |
| Würker* | (63) | 1925 | $CrO_3 + CuSO_4$ |
| Fink* | (65) | 1925 | $CrO_3$ + all sulphates |
| **(b) Simple Baths + Chromium Hydroxide** | | | |
| Salzer* | (18) | 1907 | $CrO_3$, $Cr(OH)_3 + H_2SO_4$ |
| Salzer? | (19) | 1909 | $CrO_3$, $Cr(OH)_3 + Cr_2(SO_4)_3$ |
| Grube* | (27) | 1921 | $CrO_3$, $Cr(OH)_3 + Cr_2(SO_4)_3$ |
| Liebreich* | (28) | 1921 | $CrO_3$, $Cr_2O_3 + H_2SO_4$ |
| Pierce and Humphries* | (38) | 1924 | $CrO_3 + Cr_2(SO_4)_3 + NH_4OH$ (forms $Cr(OH)_3$) |
| Hosdowich* | (60) | 1925 | $CrO_3 + Cr(OH)_3 + FeSO_4$ |
| Long et al* | (59) | 1925 | $CrO_3 + Cr_2(SO_4)_3 + CuCO_3$ (acts like $Cr(OH)_3$) |
| **II. Chromic Acid + Borate Radical** | | | |
| Placet and Bonnet?. | (3, 8) | 1890 | $CrO_3 + H_3BO_3$ |
| Baum* (not claimed). | (20) | 1912 | $CrO_3 + H_3BO_3$ |
| Fink* | (65) | 1925 | $CrO_3$ + all borates. |
| **III. Chromic Acid + Borate and Sulphate Radicals** | | | |
| Baum? (not claimed). | (20) | 1912 | $CrO_3 + H_3BO_3 + Cr_2(SO_4)_3$ |
| Suzuki? | (53) | 1925 | $CrO_3 + H_3BO_3 + Cr_2(SO_4)_3$ |
| General Motors Corp.* | (41) | 1924 | $CrO_3 + H_3BO_3 + Cr_2(SO_4)_3$ |
| Fink* | (65) | 1925 | $CrO_3$ + mixtures of stable radicals i. e. sulphates and borates |
| **IV. Chromic Acid + Fluoride Radical** | | | |
| Hambuechen? | (45) | 1924 | $CrO_3 + Na_2F_2$ |
| Fink* | (65) | 1925 | $CrO_3$ + all fluorides |
| **V. Chromic Acid + Miscellaneous Radicals** | | | |
| Grah? | (34) | 1923 | $CrO_3$ + HCl or $CH_3COOH$ |
| Hahn* | (49) | 1924 | $CrO_3 + H_2O_2$ + a Cr salt |
| LeBris* | (52) | 1924 | $CrO_3 + Cr_2O_3$ + oxidizing salt or acid |
| Fink* | (65) | 1925 | $CrO_3$ + all stable acid radicals |

* Baths satisfactory as described.
? Baths not functioning properly. In some cases this is due to the amount of substances prescribed and not to the nature of the materials.

**Age-Hardening Tests with Elektron Alloys.** By K. L. Meissner.*

Six different Elektron alloys, made up by the I. G. Farbenindustrie A.G. at Bitterfeld (Germany), were examined with respect to their capability of age-hardening by ageing at room temperature and at elevated temperatures up to 200° C. with aging periods from 8 to 40 hours.

**Cathodic Disintegration as a Method of Etching Specimens for Metallography.** By Cyril S. Smith.*

The well-known phenomenon of cathodic sputtering can be used to develop the structure of metal specimens for microscopic examination. Silver-copper alloys are particularly suited for etching by this process, which causes staining of the copper-rich constituent.

*Abstract of paper read at the Derby Meeting of the British Institute of Metals, September 6-9, 1927.

# THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

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Buyer's Guide—Advertising Page 83. Edition this month, 6,000 copies

# EDITORIAL

## COPPER INSTITUTE

A report on page 515 of this issue tells of the formation of the Copper Institute by the large copper producing companies of the United States. The purpose of this Institute as stated, is to promote a closer co-operation among producers in accumulating and disseminating better information about copper consumption and sales, and the accurate determination of actual costs in producing copper. Efforts will be made to have the producers install a uniform cost system throughout, considering the capital investment and depletion as well as the actual operating costs.

This step is directly in line with the trend of the times. Similar organizations exist in the iron and steel industry, the cotton trades, the oil producers, the zinc industry and others. The copper industry has long been aware of the dearth of information on copper consumption and distribution. Although production statistics have been published for some time through the American Bureau of Metal Statistics, and a campaign of education has been carried on by the Copper and Brass Research Association, concrete information has been almost non-existent about the quantities of copper going into various trades, the amount of material in the hands of the consumers in various stages of manufacture and supply. For that reason the Copper Institute will fill a large gap.

It seems that step by step, the copper industry is taking the measures necessary for its own protection and well-being. Copper Exporters, Inc., are handling the interests of American producers in foreign markets. The Copper Institute will distribute market information and cost data. The American Bureau of Metal Statistics will cover production figures and the Copper and Brass Research Association will educate the public and supply information to copper consumers. It may be thought at the first glance that these four agencies should be under some central guidance, but this may or may not be practical, as most of these organizations are too young to have definitely settled on their policies. If time shows that such a step is necessary, it will undoubtedly be taken.

In the meantime, the copper industry seems to be in a better position, potentially at least, than ever before.

## THE USES OF METALS

A very interesting booklet published by the Bridgeport Brass Company describes in brief, the history of sanitation with particular emphasis upon plumbing as it has developed from ancient times to the present day. It seems that the first plumbing probably consisted of a hollow tree which led water from a spring to a point where it would be used for cooking purposes. The water supply of 5,000 years ago consisted of great excavations lined with masonry, perhaps built under stone pavements, and from which water was dipped in vessels or buckets. No metal was used. In certain of the pyramids, either brass or copper drain pipes connected with masonry to lead rain and flood water to a river.

Centuries later King Solomon gave another evidence of his wisdom by having erected a huge bowl of brass for water for temple purposes. It was 9 feet high and almost 18 feet from brim to brim. The Hanging Gardens of Babylon used troughs and channels lined with bronze or lead.

The sanitary worker of ancient Rome was known as a Plumbarius, the name coming from plumbum, the Latin for lead. He was an all-around lead worker and although he made a large variety of articles therefrom, sanitation took an increasing proportion of his time and material. The most luxurious of the Roman baths used plumbing fixtures of silver, but this, needless to say, was the privilege of the very few.

Details could be added indefinitely, tracing plumbing fixtures through the centuries. The most interesting point to the present day metal trades, however, is the tremendous increase in the use of brass during the last five years for pipe and other plumbing fixtures. Pipe is becoming one of the important outlets for this material.

It is a development to be proud of, for social as well as business reasons. Improvement of sanitation is one of the most important fields of human endeavor. We are all the more impressed with this point of view when we read of the use of a hand-hammered copper coffin priced at $10,000 to bury a dancer recently deceased. The dancer, a negro girl, whose rose to a position of international prominence in her profession undoubtedly deserved the rewards which she received during her life. From the point of view of the best uses of our natural resources, however, her executors could have been better advised. Metals are too useful and perhaps some day will be too scarce to bury underground.

## CIVIL WAR IN CONNECTICUT

We have just been apprised of an extraordinary situation in the Naugatuck Valley. This district has always been the leading brass producing center of the United States, and we have always thought, enjoyed a spirit of solidarity and brotherhood. To be sure various cities competed with each other and even in the same city different firms were engaged in the same lines of business, but essentially their interests were common and depended upon the prosperity of the brass trade.

Picture our astonishment then when we received a communication informing us that city officials and other civic leaders of Waterbury were much disturbed recently at learning that some new brass studs driven into the street to mark the crosswalk in front of the City Hall, were not made in Waterbury but in the neighboring city of Bridgeport. "A good humored but at the same time indignant protest resulted in the studs being removed

at once. It was declared to be little less than treason for the government of the "Brass Center of the World" to make use of brass made in a rival city, particularly in so conspicuous a place as a public street."

The way this "treason" came about was that a member of the Board of Works in charge of the streets is a friend of an official of the Bridgeport brass manufacturer. He was sent, as a gift, a quantity of these studs, and without considering the matter seriously, turned them over to the street superintendent who installed them in the most conspicuous street in the city to test their wearing qualities. The fact that they were made outside of Waterbury was brought to the attention of the city officials by the newspapers. None of the Waterbury brass company officials made any protest but a number of other prominent citizens did. The result was a Board Meeting and a warm debate, which must have been a spectacle for the gods. In answer to the protests of the indignant defenders of Waterbury's honor, it was solemnly stated that the use of brass studs from another city for street purposes was perfectly proper and showed the contempt with which Waterbury looked upon the "foreign" brass. It would be trod upon, ridden over, expectorated upon and covered with the usual street refuse.

Needless to say the loyal city officials at once removed these eyesores and replaced them with similar brass studs made by "friends" instead of "enemies." Reason totters at what might have happened had these nefarious studs from Bridgeport been allowed to remain. Waterbury would have been smirched forever!

From the point of vantage of those interested in the brass industry as a whole and believing that its good lies in co-operation rather than in squabbling, we take the liberty of suggesting to Waterbury that they really owe a vote of thanks to the Bridgeport company for its initiative in working out a new use for brass. It is an evidence of the good sense and balance of the Waterbury brass companies that they did not join these protests but preserved their dignity. We have a suspicion also that the city officials did not take their discussion so seriously as the newspapers would lead us to believe. However, politics is politics.

## FUELS

Probably the greatest source of energy clearly visible to us is the sun, but according to the opinions of eminent chemists, that source of molecular activity will not be available for hundreds and perhaps thousands of years. The most abundant and the most easily reached reserve consists of the deposits of coal and oil in the ground. For that reason these two materials and their derivatives are practically supreme as original sources of heat and power.

The outstanding exception is, of course, water power to produce electrical energy, but so far the cost of electricity has been too high to permit it to compete with coal or oil as a fuel in more than a few specialized fields.

At a recent conference on fuels of the American Society of Mechanical Engineers, Professor S. W. Parr of the University of Illinois, traced the history of fuels on the American continent. At the time that coal was first commercially worked (about 1810) the supplies seemed without limit. Wood, which also seemed unlimited in extent, was used for 80 per cent of the fuel in 1826. Contrast this condition with the situation to-day, when 80 per cent of our fuels consist of smoke-making materials such as bituminous coal or oil. A total of 600,000,000 tons of coal are consumed in a year.

The result is that our coal supplies are no longer unlimited in extent. Not that there is any immediate danger in this or the next generation of the exhaustion of our coal beds, but the fact that they will not last forever has acted as an additional spur to fuel engineers and designers of heat using devices to greater efforts for fuel economy.

As a result, we have to-day better furnaces, both household and industrial, and better methods of using coal, such as automatic stoking, powdered coal, coal gas, etc.

Professor Parr states flatly that "the ideal fuel as a heating medium is gas. Its smokeless combustion, high efficiency, cleanliness and convenience give it a status unapproached by any other type of fuel. When it reaches the stage of volume production to an extent where costs can be materially reduced, the extent of its use will be greater than can be remotely realized at the present time."

Coal producers are known for their silence in the face of criticism of their product as a heat producer. They have rested always on the fact that it is basic and the cheapest and easiest to obtain of all fuels. But what say the advocates of electric furnaces? A very warm discussion could be provoked between friends of gas and electricity on the question "What is the ideal fuel?"

## GOVERNMENT PUBLICATIONS

**Fifteenth Annual Report of the Secretary of Commerce.** For the Fiscal Year Ended June 30, 1927. Superintendent of Documents, Washington, D. C. Price 30 cents.

**Machinery.** Metal-Working Machinery (including machine tools) Pumps and Pumping Equipment, Textile Machinery and Parts; Typewriters, Foundry and Machine Shop Products. Census of Manufactures: 1925. Superintendent of Documents, Washington, D. C. Price 10 cents.

## TECHNICAL PAPERS

**Properties of Refractories in Zinc Metallurgy.** By E. S. Wheeler, A. H. Kuechler and H. M. Lawrence School of Mines and Metallurgy, University of Missouri, Rolla, Mo.

This is a report of an investigation to obtain the pertinent facts relative to the problem of refractories in the zinc industry. Various raw materials were experimented with and chemical and physical tests made on these materials; also working tests under operating conditions.

**The Mission and the Needs of the United States Navy.** A Collection of Articles and Addresses reprinted from the U. S. Naval Institute Proceedings for October, 1927.

This collection includes articles by officials in the Navy Department and officers of the Navy on the relation of the Navy's work to the interests of the Nation both political and commercial.

**Iron and Steel Industry and British Foundryman.** Published by Louis Cassier Company, Ltd., London, England.

This is a new journal on the iron and steel industries covering the production of iron, common steel and alloy steels. It is being sponsored by the publishers of The Metal Industry of London.

# SHOP PROBLEMS

THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

## ALUMINUM ALLOY FOR PRESSURE

Q.—If an alloy consisting of 12½% zinc, 3% copper, and balance aluminum, is cast in permanent mold, do you figure that it would be dense enough to withstand a hydrostatic pressure of 50 lbs.? Using oil, would the oil filter through the castings? Walls of casting are about 3/16 to ¼ inch thick.

A.—We would not recommend such an alloy for hydrostatic pressure. We suggest an alloy of 84 aluminum, 12 copper and 4 silicon. We suggest you make the mixture as follows: melt 68 lbs. of aluminum and add 24 lbs. of a hardener of 50 copper and 50 aluminum; then add 8 lbs. of a mixture of 50 aluminum and 50 silicon. Flux with chloride of zinc, and we think this mixture will meet your requirements.

These hardeners can be had from people making a specialty of such alloys. Look in the METAL INDUSTRY advertisements.—W. J. R. Problem 3,701.

## ALUMINUM IN BRASS

Q.—Will you please advise at your earliest convenience what percentage of aluminum can ge safely used in yellow brass and composition metal for pressure work such as valves, ball cocks and ground joint unions?

A.—We do not recommend any aluminum be added to yellow brass for pressure work such as valves. Aluminum is an excellent flux to add to yellow brass to suppress fumes and aid the running of the metal in the casting. The draw-back, however, of adding aluminum to yellow brass is that it causes drossing and if this dross enters the mold a large percentage of the castings if subject to water pressure will be found to leak. This can be avoided to a large extent by arranging the gates that no two streams of metal will impinge either against each other or against the side of the mold. In other words arrange the gates so the brass will run into the mold smoothly. There must be no agitation, otherwise dross will form and cause leaks.—W. J. R. Problem 3,702.

## BLACK ON BRONZE

Q.—I have a large vault door and frame to be oxidized black. It is a bronze casting. I have been using liver of sulphur, ammonia and water for this kind of work. It seems I cannot get it black. Can you give me a formula that will blacken bronze that can be used with sponge and by hand?

A.—If you are unable to produce a sufficiently dark color on bronze metal with the use of a regular liver of sulphur dip, then it is advisable to either use one or the other of the following solutions, applied similarly to liver of sulphur. However, the solutions must be heated to 180 deg. F. or the bronze articles should be heated to the temperature of boiling water. If the work is too large to immerse and then the hot solution is applied by a sponge.

Solution No. 1

| | | |
|---|---|---|
| Water | 1 | gallon |
| Lead acetate | 8 | ozs. |
| Hyposulphite of soda | 16 | ozs. |
| Temperature | 180° | F. |

Solution No. 2

| | | |
|---|---|---|
| Water | 1 | gallon |
| Caustic potash | 8 | ozs. |
| Red sulphite of antimony | 1-2 | ozs. |
| Aqua ammonia | ½-1 | oz. |
| Temperature | 180° | F. |

Liver of sulphite ozidized finishes can be darkened by applying a weak acid dip afterwards; Water 1 gallon; Sulphuric acid 4 ozs.; cold solution.—C. H. P. Problem 3,703.

## BRASS STAMPING DIES

Q.—In stamping the title on a book we use brass dies. The press used in this case is heated to 400° F. Before the stamper uses the brass die, I take a mold of the brass die as a safeguard and run on a heavy copper shell and back same up with electrotype metal (80 lead, 4 tin, 3 antimony). Our electrotype metal melts at about 525° to 600° F. The electrotype die will not stand up as well as the brass. We thought, perhaps there would be some way out of this by casting a plaster of paris matrix of several dies at one time and pouring a metal mixture of some kind which would give us a die almost as hard as the brass die.

A.—There is a method used in casting brass in plaster that may suit your conditions. Plaster paris 90% and lime 10% are mixed together as follows: 1 qt. water, 3 lbs. of plaster mixture and pour in the mold. Suitable apparatus must be made to draw the patterns from the mold. The mold is then dried in an oven for 10 hours at 500° to 600° F., then taken out and poured as soon as possible. The mixture used is 59½ copper, 40 zinc, ½ aluminum. Castings made in this manner are very sharp and resemble castings made in dies and may suit your requirements.—W. J. R. Problem 3,704.

## BRIGHT DIPPING BRASS

Q.—I would like some information on plating, as I wish to become a plater. I am working for a radio concern where they handle nothing but brass condensers and they are to be dipped in A1 condition. They come out full of soldering acid and plenty of vaseline. What I would like to know is a good potash to use for them and is there anything in regard to a special dip. I use a prepared cleaner and it does not seem to take off the vaseline. The dip is made in 2 parts sulphuric and 1 part nitric acid first and then flash in a special dip made of 1 part sulphuric acid, 1 part nitric acid. It does not give good results. I then flash in a strong cyanide dip, then cold water and dry in hot water. I do not use sawdust because the condenser plates are too thin to handle. That is where my trouble is. After the hot water and when they are placed in the oven hot, they all tarnish and stain. Please let me have a good bright dip for these condensers; also would like to know of a good cleaner. I have heard that whale soap is good, but have never used it.

A.—We suggest the following procedure for acide bright dipping radio condenser plates. Vaseline is a very hard material to remove with ordinary cleaners. Why not try either hot kerosene oil or naphtha spirits. Both of these materials can be heated with steam coils just the same as your cleaners. Keep them covered when not in use. From the above cleaners, drain well then cleanse in your prepared cleaning solution. It it is not strong enough to cut the remaining vaseline from the condenser plates, then add 2 ozs. caustic potash and ½ oz. sodium cyanide per gallon of prepared cleaner. From this cleaner, wash the plates in cold water, then immerse them in an aqua fortis dip without any sulphuric acid. Aqua fortis is better known as 36° or 38° nitric acid. Immerse the plates in the aqua fortis dip for a moment, then remove and wash them in cold water; immerse in the prepared cleaner for a moment, then remove. Do not wash in water. Prepare a bright acid dip from the following proportions:

| | | |
|---|---|---|
| Aqua fortis or nitric acid 36°-38° | 1 | gallon |
| Sulphuric acid 66° | 1 | gallon |
| Water | 1 | pint |
| Muriatic acid | 1 | oz. |

Prepare as many gallons as desired; always the day before using. Surround the container with cold running water. The acids must not become heated above 70 or 80 deg. F.

Immerse the condenser plates in the bright dip for a moment, move rapidly while in the dip, then remove and wash thoroughly in cold water. Use a dilute cyanide dip if desirable, to remove any acid dip stains, then wash again thoroughly in cold water.

Prepare a cold soap dip on the basis of 1 oz. Black Platers' Compound per gallon of water. Dissolve the soap first in as little boiling water as possible to dissolve it, then add to the cold water to make up the quantity required. Dip the bright acid dipped plates in the cold soap solution for a moment, then rinse them in boiling hot water; drain thoroughly. They will not stain.—C. H. P. Problem 3,705.

## BRIGHT GOLD

Q.—Kindly inform us of a good bright gold plating solution. Also the method for doing this work and any information that you think would be necessary in producing a high grade bright gold plate. We would also like to know a good method for color buffing this work, including any equipment that you think would be necessary.

A.—The following formula for bright gold solution is used extensively in the East.

| | |
|---|---|
| Water | 5 gallons |
| Sodium cyanide 96-98% | 4 ozs. |
| Sodium gold cyanide | 2 ozs. |
| Phosphate of soda | 8 ozs. |
| Hyposulphite of soda | 5 ozs. |

To prepare the solution, dissolve the sodium cyanide in 1 qt. of water at 140 deg. F., then add the sodium gold cyanide. In 1 quart of water at 140 deg. F., dissolve the phosphate of soda; in a third quart of water, dissolve the hyposulphite of soda at the same temperature. In 4 gallons and 1 quart of water at 140° F., first add the sodium and gold cyanide solution, then the phosphate of soda and finally the hyposulphite of soda solution; all with constant stirring. The solution is then ready for operation at 160 or 180 deg. F., at 4 to 5 volts, anodes fine gold. Some small rolled sheet nickel anodes may also be used. A little nickel in the gold results in a harder gold deposit. We suggest that you prepare a small bright gold solution first and try it out on small parts. Bright gold deposits require practically no final polishing except to remove water stains. Buffs for the purpose should be made up of Canton flannel about 6 inches in diameter. The polishing medium should be the finest English powdered red rouge procurable. Mix with denatured alcohol. A very little kerosene oil may be used to mix with the alcohol to prevent too rapid evaporation. Regular small polishing lathes with extension suitable for buffing your product should be used.—C. H. P. Problem 3,706

## BRONZE ON HINGES

Q.—How can I do bronze plating on hinges?

A.—We suggest the following formula for bronze plating solutions.

| | |
|---|---|
| Part No. 1 | |
| Water | ⅞ gallon |
| Sodium cyanide | 4 ozs. |
| Copper cyanide | 3 ozs. |
| Bisulphite of soda | 1½ ozs. |
| Caustic soda | ½ oz. |
| Part No. 2 | |
| Water | 1 pint |
| Zinc cyanide | ¾ oz. |
| Sodium cyanide | ½ oz. |
| Caustic soda | ¼ oz. |

To prepare the solution, dissolve the sodium cyanide and copper cyanide in one half gallon of hot water, then add 3 pints cold water and add the caustic soda and bisulphite of soda. In one pint of water, the same temperature, 160° F., dissolve the sodium cyanide, zinc cyanide and caustic soda. Mix the solutions thoroughly; a very little hyposulphite of soda may be used to brighten the deposit, not more than 1 oz. per 100 gallons of solution. If a lighter bronze is required, then add sal-ammoniac to the solution from one quarter of an oz. upwards per gallon of solution. The solution should be operated as near to 80 deg F. as possible. Anodes should consist of 90% copper, 9% zinc, 1% tin. Voltage 4 to 5. The upkeep of the solution should be with sodium cyanide ⅛ oz. per gallon per day, and 1/32 oz. of bisulphate of soda. Sal-ammoniac should be added only as a toner for the color of the bronze deposit. The water line should be maintained constant. In plating cast iron or malleable iron, there is always an advantage in either nickel or copper plating the surface first with uniform deposits before final bronze plating. When the bronze deposit approximates a light colored acid copper deposit, then the bronze plate will polish up to a normal color.—C. H. P. Problem 3,707.

## COBALT PLATE

Q.—We are manufacturing an auto direction signal and are contemplating using a cobalt plate. Will you kindly give us your candid opinion as to the advisability of such action. Is it practical? Is the cost excessive? Has it any appreciable advantage over nickel plate? Can the cobalt salts be obtained readily? Will cobalt plate, on steel, stand up? Will cobalt plate tarnish as quickly as nickel, when exposed to salt air or gas fumes, etc., etc?

A.—We do not advocate the use of an exclusive cobalt plating solution for your or any other product of a similar nature. Cobalt solutions have never proved commercially successful as compared with nickel solutions, although certain additions of cobalt to special nickel solutions have resulted in whiter nickel deposits that withstand the action of atmospheric moisture and oxidation much better than nickel alone. This also means that gas fumes will not attack the nickel-cobalt as readily.

We give you two solutions containing cobalt salts.

| | | |
|---|---|---|
| No. 1. | Water | 1 gallon |
| | Nickel sulphate | 16 ozs. |
| | Cobalt chloride | 2 ozs. |
| | Boracic acid | 1½ ozs. |
| | Epsom salts | 8 ozs. |
| No. 2. | Water | 1 gallon |
| | Double nickel salts | 8 ozs. |
| | Single nickel salts | 2 ozs. |
| | Cobalt sulphate | 2 ozs. |
| | Boracic acid | 1½ ozs. |

The solutions should be prepared in the usual manner as for nickel solutions. Anodes consisting of about 90% area of nickel and 10% cobalt anodes, can be used to maintain the cobalt content fairly constant. Cobalt is much more expensive than nickel. Anodes cost about $2.00 per lb. and cobalt sulphate about 90c. which is more than 8 times the cost of nickel sulphate, commonly termed single nickel salts. The cobalt nickel solutions should be maintained at about the same acidity as nickel solutions, pH 5.4 or 5.8. Their preparation is the same as nickel solutions.—C. H. P. Problem 3,708.

## NICKEL ON CAST IRON

Q.—We are plating iron castings. First we pickle in diluted sulphuric acid to losen scale, wire brush, grind the high parts, copper plate first and nickel plate. Hygrometer register 6, blue litmus paper turns pink and pink paper turns blue. The plating is bright on high spots and black on background.

A.—Evidently your solution lacks conductivity, is low in nickel and is high in free acid. Make these additions to your nickel solution per gallon.

| | |
|---|---|
| Single nickel salts | 2 ozs. |
| Nickel chloride | 2 ozs. |
| Common salt | 4 ozs. |

Test these additions out first in a 10 or 20 gallon solution taken from your tank. If your solution turns blue litmus paper to red, then it will be necessary to add a little ammonia, about ⅛ oz. per gallon of solution, or 10 ozs. per 100 gallons of solution, to reduce the acidity.—C. H. P. Problem 3,709.

## STRIPPING SILVER

Q.—Will you please send us a formula for making both an acid and a cyanide strip for taking the old silver off of pewter ware that is to be re-silvered.

A.—We suggest that a cyanide strip solution be used to remove the old silver from the pewter articles to be replated. The following formula will give excellent results: Water, 1 gallon; sodium cyanide, 12 ozs.; caustic potash, 2 ozs. The articles to be stripped become the anode. Use sheet steel as the cathodes. Voltage, 6. Use as high a current as possible to strip the silver. If the articles are not badly scratched they may be scratch-brushed wet with a little pumice stone flashed in a silver strike and replated as usual. Acid strips are not advised. The following can be used, however: Water, 1 gallon; nitric acid, 8 ozs. Cathodes, lead.—C. H. P. Problem 3,710.

# PATENTS

**A REVIEW OF CURRENT PATENTS OF INTEREST**

1,644,741. October 11, 1927. **Uniting Dissimilar Metals.** Harry C. Mougey, Dayton, Ohio, assignor to General Motors Research Corporation, Dayton, Ohio.

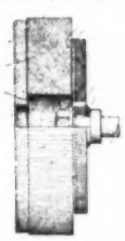
The process of uniting a flexible copper body to the curved surface of a ferrous body, which comprises placing between the two bodies a flexible brass sheet coated with zinc and heating the brass and zinc sufficiently to cause them to alloy and thus bond the two bodies together.

1,645,011. October 11, 1927. **Replaceable Liner for Reverberatory Furnaces.** Briggs R. Kenney, Miami, Ariz.

In a reverberatory furnace construction the combination of stationary elongated floor, side walls, and roof supported by the side walls defining an elongated combustion chamber, and an easily replaceable and removable liner construction for the combustion chamber.

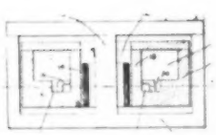
1,645,037. October 11, 1927. **Abrasive Sheet Material.** Gustave E. Behr, Jr., Brooklyn, N. Y., assignor to National Lead Company, New York.

The method of making flexible abrasive sheet material which consists in combining with a sheet cellulose base, a waterproofing agent impregnated through the fibres thereof, and a separately applied grit-holding coating of adhesive, miscible with said agent but different therefrom.



1,645,047. October 11, 1927. **Buffing Device.** William L. Goodstein, Yonkers, N. Y.

A polishing head comprising a soft felt disc, a cushion pad of greater diameter and far greater thickness, said pad being adapted to absorb heat, a semi-yieldable backing for said pad, means to cause adhesion between said elements, and an arbor fixed in said backing to drive the head.



1,645,074. October 11, 1927. **Electric Furnace.** John A. Seede, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

An electric induction furnace comprising heat refractory walls providing an open loop reservoir for the charge and a closed loop heating channel communicating with said reservoir at remotely separated regions, and an electrical winding for inducing a heating current in a conductive charge in said channel.

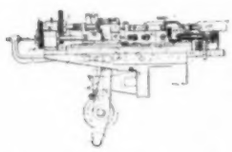
1,645,098. October 11, 1927. **Lead Cadmium Alloys.** Walter Friedrich, Neiderschoneweide, Germany, assignor to General Electric Company, a Corporation of New York.

As an article of manufacture a cable casing consisting of an alloy of lead and cadmium, the cadmium being present as a minor constituent.

1,645,099. October 11, 1927. **Resistance Alloy.** Truman S. Fuller, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

An alloy consisting largely of aluminum and containing from 4 to 10% of manganese and from 2 to 8% of zinc.

1,645,167. October 11, 1927. **Die-Casting Machine.** George A. Theobald and Theodore A. Olson, Boston, Mass., assignors to Pollock Pen Company, Boston, Mass.



A die casting machine of the character described, consisting in a frame having a reciprocating means mounted thereon, a die and a metal supply means communicating therewith, a rotable element carried by the reciprocating means having die closure members thereon adapted to co-operate with the die during molding periods to form slugs, and means for automatically removing the slugs from the die closure members.

1,645,526. October 18, 1927. **High-Frequency Electric Furnace.** Felix Gerth, Berlin-Tempelhof, Germany, assignor to C. Lorenz Aktiengesellschaft, Berlin-Tempelhof, Germany.

A high frequency electric furnace of the character described comprising in combination a crucible, and a heating oil embracing the crucible and wound so that at least certain of its turns decrease in diameter, rendering it conformatory in contour to the contour of the cruicible, whereby marginal disperion or fringing of the magnetic field is minimized and the number of lines of force permeating the crucible and producing the heating action is increased.

1,645,725-1,645,732 inclusive. October 18, 1927. **Mold.** Conrad Vaughan, Cleveland, Ohio, assignor to The Permold Company, Cleveland.

A number of patents on a new type of permanent mold and methods of casting alloys in said mold.

1,645,927. **October 18, 1927. .Chromium Plating.** Harrie C. Pierce, Indianapolis, Ind., assignor to Metals Protection Corporation, Indianapolis, Ind.

A process of plating a metal article with chromium in an electrolyte containing chromic acid, which consist in directing an electric current first through the article as an anode and then through the electrolyte to an electrode contacting with the electrolyte, and then reversing the current flow so that it passes through said electrode and then through the electroyte and the article to be plated, said article thus being made the cathode in the bath.

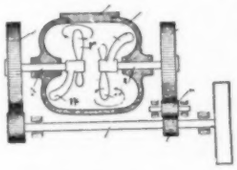
1,646,239. October 18, 1927. **Process of Recovering Aluminum from Oily Metallic Mixtures and the Like.** John G. Frost, Cleveland, Ohio, assignor to The National Smelting Company, Cleveland, Ohio.

The method of recovering aluminum from a mixture of finely divided aluminum and iron containing viscous combustible material which has already been subjected to the action of a magnetic separator, which comprises exposing said mixture to a flame in an oxidizing atmosphere to consume the viscous materials, and delivering the free metallic particles to a magnetic separator.

1,646,862. October 25, 1927. **Induction Furnace.** William Hoskins, Chicago, Ill.

An induction furnace comprising a curved rifled trough supported within a furnace setting, conducting material in said trough, means for inducing an electric current in said material whereby a rotation of said material is produced, and means for supplying material to and withdrawing material from said trough.

1,647,249. November 1, 1927. **Rounding of Metallic-Powder Particles.** Emil Podszus, Berlin-Friedrichshagen, Germany, assignor to Hartstoff-Metall Aktiengesellschaft (Hametag), Berlin-Copenick, Germany.



The method of rounding metallic powder particles which comprises subjecting the mass of particles to a pressing and rubbing action and positively pushing said particles repeatedly through the mass while being pressed and rubbed.

1,647,301. November 1, 1927. **Alloy for Pen Points.** Kurt K. Ledig, Newark, N. J., assignor to American Platinum Works, Newark, N. J.

An alloy of the class described containing sixty parts molybdenum, twenty parts nickel-copper alloy, said alloy consisting of 70 parts nickel and 30 parts copper, ten parts tungsten, and ten parts ruthenium.

# EQUIPMENT

## NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

### THE NICKELOMETER

A new instrument, the Nickelometer, designed to enable the nickel plater completely to control the chemical composition of his bath, has recently been placed on the market.

There have been instruments for measuring and controlling certain single ones of these chemical factors, but inasmuch as the factors depend so much upon one another a complete knowledge of all of them is essential for the best results in plating. This complete knowledge could be obtained formerly only by a long and complex chemical analysis.

The Nickelometer measures the acidity or hydrogen ion concentration of the bath directly to the nearest 1/10 pH unit. It measures the metallic nickel content of the solution directly in ounces per gallon, and also measures the chloride concentration to the nearest 1/10 ounce per gallon. The instrument can be used by anyone without previous experience and a complete test of these three factors may be made in about one minute.

In nickel plating too high a concentration of hydrogen ion, that is, too low a pH value invariably causes pitted, cracked and curled deposits, while too low a concentration causes dark deposits. The important factor is the intensity of the acid in the bath, not the quantity. Titration measures the quantity of acid and does not give the value in pH units. The Nickelometer measures the actual pH value by dropping a drop of indicator dye into a small sample of the solution and comparing the color with a small double-wedged color standard. As this double wedge is a complete unbroken sheet of varying color the comparison is very easily and accurately made. Accuracy is very essential because the complete range of variation of the solution is usually between pH 5.4 and 6.0, and the individual plater will usually find his best results at some point between these values. Occasionally in agitated solutions it is found advisable to run the solution up as high as pH 6.8, and the Nickelometer covers the complete range from pH 5.2—6.8.

An exact knowledge of the hydrogen ion concentration must be considered, however, in connection with the other factors in the bath. Low nickel content, for example, causes burnt or spongy deposits and the plater must know both of these factors in order to correct these conditions.

The Nickelometer measures the nickel content by comparison with another wedge similar to that used for the pH measurement. Here again the unbroken sheet of color variation which the wedge presents is of very great assistance.

With a knowledge of these two factors the plater is able to do a great deal, but there has been found to be a third which varies considerably and which must be controlled in order to maintain the bath in its most favorable condition. This is the concentration of the chlorides in the solution. If a certain concentration of chlorides is found to be necessary to overcome anode passivity a measurement of this will tell the plater whether this factor is at its proper point and if not just how much must be added to bring it there. It has never before been practicable to measure this factor except by complex and cumbersome methods. The Nickelometer measures it by a simple drop test wherein drops are added to the solution until its color changes, each drop representing 1/10 ounce of chloride per gallon.

THE NICKELOMETER AND SOLUTIONS

The entire instrument is contained in a small carrying case about five inches by five inches by three and one-half inches. The case is finished in a bright red and equipped with a spring catch. All necessary parts and solutions are included in this case and all parts are renewable. It is made by the Stirlen Company, 70 College Avenue, New Haven, Conn.

### UDYLITE PROCESS SPREADING

While the Udylite Process of rust-proofing is already well-known to American manufacturers as a result of several years of successful application in a number of industries, nevertheless this method of coating metal products with cadmium is said to be constantly gaining adherents in new fields of manufacture.

When Marvin Udy first developed the electrolytic application of cadmium as a rust-proofing agent in 1921, his idea was to provide a coating for piano wires that would be extremely thin, absolutely non-porous, and which would not scale, chip or blister. Today Udylite is applied in such varied instances as on adding machine parts, automobile parts, cameras, fish-reels, play-ground equipment and roller-skates. The newest applications are on radio equipment and airplane parts.

A list of radio manufacturers employing the Udylite process would include the Crosley Radio Corporation, of Cincinnati, which so treats all metal parts of its entire product; Radio Corporation of America, which uses Udylite rust-proofed parts supplied by the Westinghouse Electric Company; Wireless Radio Corporation, Brooklyn, N. Y.; Brandes Products Company, Newark, N. J.; Day Fan Electric Company, Dayton, Ohio, and Nathaniel Baldwin Radio Company, Salt Lake City.

In the aeronautical industry the list is an impressive one, including both branches of the national defence, as well as many of the leading private companies. The list comprises the United States naval aircraft factory at Philadelphia; McCook Field, Dayton, Ohio, the army aircraft headquarters; Rockwell Field, Coronado, Cal.; Consolidated Aircraft Corporation, Buffalo; Curtiss Airplane and Motor Company, Buffalo; Boeing Airplane Company, Seattle, and Standard Steel Propeller Company, Pittsburgh, Pa.

On planes manufactured by private concerns for both government agencies, cadmium coating is specified for rust-proofing purposes, and unofficially the Udylite process is often suggested.

In a recent letter to the Udylite Process Company, of Detroit, the Boeing Airplane Company, one of the leaders in the industry, wrote in part as follows:

"Several months ago the Boeing Airplane Company discontinued the use of all other forms of electro-plating and standardized on the Udylite process for all ferrous metal parts. The results obtained have more than justified this decision.

"You have asked us to make an expression as to the success which we are having with Udylite. In reply we are sending you a description and photographs of the Boeing mail planes, twenty-five of which are now being completed. Every ferrous metal part on these planes has been coated with Udylite."

Several months ago the Udylite Process Company, which hitherto had operated in Kokomo, Indiana, was removed to Detroit when it was purchased by the General Chromium Corporation, affiliated with United Chromium, Incorporated, of New York. The Udylite Process Company is now operated as a unit of the General Chromium Corporation.

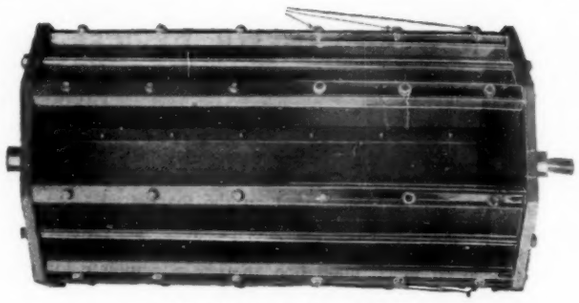
## HIGH-SPEED PLATING BARREL

The Mercil Plating Equipment Company of 1917 Fulton Street, Chicago, Illinois, has developed and placed on the market a barrel for mechanical plating which plates much faster than any other barrel. In actual use it is said to turn out from 25 per cent to 100 per cent more work in a day than is possible with barrels of the type that have been in general use in the past few years.

A specially prepared Bakelite product, equal in tensile strength to cast iron, is used for the entire framework of the barrel, including the ends and flanges. The same material, in a lighter gauge, is used for the removable perforated panels.

This special material affords perfect insulation and is practically impervious to the acids and alkalis of plating solutions. It withstands successfully even the strong cyanide solutions.

A built-in cathode is molded in the Bakelite, so there is no rod running through the center of the barrel, nor are there any bulky inside contacts. The small contact heads are placed on the outside of the frame, there being several on each cross piece as illustrated. These small button-like contacts are the only metal that is exposed to the work and the solution. When these contacts become coated with deposit they can be removed, stripped and replaced, all of which is a short simple operation.



MERCIL PLATING BARREL

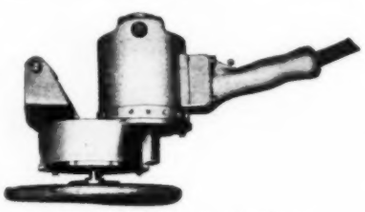
This arrangement of contact heads gives equal distribution of current to all parts of the cylinder and results in much faster plating.

The Mercil Barrel is not limited to any one solution, but, it is claimed, may be used successfully in nickel, brass, copper, bronze, zinc, cadmium, udylite and other plating solutions.

This barrel is made by the Mercil Plating Equipment Company of Chicago. The Hanson-Van Winkle-Munning Company are exclusive distributors.

## POLISHING AND SANDING MACHINE

The Nedco polishing and sanding machine is made by the Nedco Machine Company of Boston, Mass. It is portable, equipped with a ¼-h.p. universal motor which can be run from any electric light socket. This machine uses the same felt discs used by the Carborundum polishing machine and is built to replace the hand methods of finishing, such as filing or hand buffing. It is recommended specially for sanding, grinding and finishing automobile bodies, replacing the file, wire brush, and emery. It can also be used for polishing Duco or lacquer to obtain a high lustre.



NEDCO SANDING MACHINE

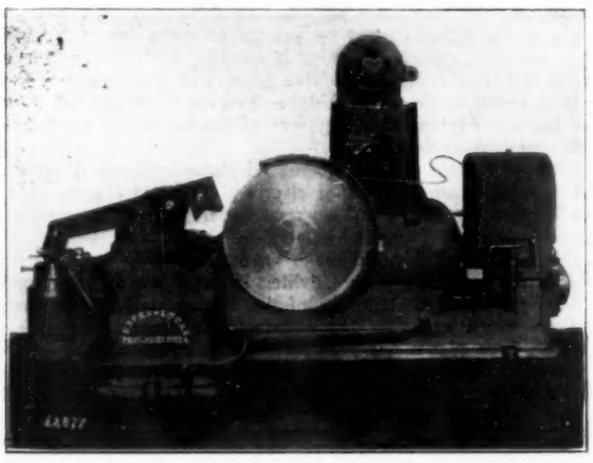
## SAWING MACHINE

The Epsen-Lucas Machine Works, Philadelphia, Pa., are manufacturing a production cut-off saw through application of principles, making not only for fast sawing but also quick handling of material and machine between saw cuts.

It is designed expressly for cropping ends and sawing to lengths cast, solid and tube billets, supplying a sufficient quantity of billets to an extruding mill that requires two (2) billets per minute; machine sawing through 7″ diameter solid billets in 7 seconds, plus 3 seconds for clamping and unclamping. Output is dependent upon facilities for passing work through the machine. With suitable apparauts complete cycle of operations can be made in 15 seconds.

Quick return as well as quick feed traverse to saw carriage is effected by Espen-Lucas low pressure (hydraulic) oil feed system; quick-acting clamp, either air or oil pressure operated; complete controls at table end. Material may be passed from machine without workman touching it.

The machine may be driven by either direct or alternating current motor and, according to characteristics of metal to be cut off, by constant, multi- or variable-speed motor.



ESPEN-LUCAS CUT OFF SAW

## EQUIPMENT AND SUPPLY CATALOGS

**Metered Combustion Control.** Leeds & Northrup Company, Philadelphia, Pa.

**Outdoor Lighting Equipment.** Artistic Lighting Equipment Association, New York.

**Collecting Fly-Ash and Coal Dust.** American Blower Company, Detroit, Mich.

**Rapid Core Machine.** The American Foundry Equipment Company, Mishawaka, Ind.

**Nitralloy and the Nitriding Process.** Ludlum Steel Company, Watervliet, New York.

**The Production of Hot Pressed Brass Parts.** Zeh and Hahnemann Company, Newark, N. J.

**Norton Chuck.** For segmental wheels on Blanchard machines. The Norton Company, Worcester, Mass.

**Heat Treating Furnaces.** Car and Car-and-Roll type. Electric or fuel fired. W. S. Rockwell Company, New York.

**Machinery for the Manufacture of Strips, Sheets, Tubes, Rods, Wire and Cable.** The Torrington Company, Torrington, Conn.

**International Nickel Publications.** Alloy Cast Iron Meets High Duty Requirements; Bulletin No. 11. Notes on Machining Alloy Steel; Instructions for Adding Nickel to Cast Iron.

**Plating Racks.** Belke Manufacturing Company, Chicago, Ill. A description of all types of plating racks sold by this company, a number of formulae for solutions, devices and equipment and other information are included.

**General Electric Publications.** Oil Tempering Baths, Electrically Heated; Controllers for A. C. Slip Ring Induction Motors; Ball Bearing Construction as used in G. E. Alternating and Direct Current General Purpose Motors; Magnet Frames; Solid vs. Split Gears for Railway and Industrial Haulage Motors; Capacitors for Power; Direct Heat Electric Furnace. General Electric Company, Schenectady, N. Y.

# ASSOCIATIONS and SOCIETIES

**REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS**

## AMERICAN FOUNDRYMEN'S ASSOCIATION

**HEADQUARTERS, 140 SOUTH DEARBORN STREET, CHICAGO, ILL.**

The Twenty-first Annual Foundry and Machine Equipment Exhibit will be held in conjunction with the Thirty-second Annual Convention of the American Foundrymen's Association, at the Commercial Museum, Philadelphia, Pa., May 14-18, 1928. The Exhibition Hall where the Exhibit will be housed is a large building with concrete floor, high ceiling and well adapted to the installation of all kinds of equipment.

Full information can be obtained from the Secretary of the Association at the above address.

## NATIONAL FOUNDERS ASSOCIATION

**HEADQUARTERS, 29 SOUTH LA SALLE STREET, CHICAGO, ILL.**

The National Founders Association held its Thirty-first Convention at the Hotel Astor in New York, Nov. 16-17.

William H. Barr of Buffalo was re-elected president; C. S. Koch, McKeesport, Pa., vice-president; J. M. Taylor, Chicago, secretary, and A. E. McClintock, Chicago was re-appointed commissioner. The program included a number of papers and reports on economic and technical subjects, among which were the following:

Report of Committee on Industrial Education. By L. W. Olson, chairman.

Government in Business. By R. C. Marshall, Jr.

The Foundry of Tomorrow. By E. A. Custer, Jr.

Why Most Foundries Operate at a Loss. By E. T. Runge.

The Aims and Functions of the Educational Department of the National Founders Association. By L. A. Hartley.

## PHILADELPHIA METALS ASSOCIATION

**HEADQUARTERS, CARE OF CLARENCE B. WHITE, WHITE & BROTHER, PHILADELPHIA, PA.**

It is reported that dealers and smelters of nonferrous metals in Philadelphia have formed the Philadelphia Metals Association. A constitution and bylaws will be presented at a meeting to be held shortly.

Officers elected include Henry Rosenthal, president; Clarence B. White, vice-president; Harry S. Goldstein, treasurer, and Meyer M. Robinson, secretary.

"The Philadelphia Metals Association," said Mr. Rosenthal, "is a trade organization to promote the interests of the members, improve relations between them, establish equitable trade customs, raise standards of packing of metals and in other ways work for the interests of the members in matters and problems pertaining to the local trade. This is a Philadelphia organization."

## PHILADELPHIA BRANCH, A. E. S.

**HEADQUARTERS CARE OF PHILIP UHL, 2432 N. 29th STREET, PHILADELPHIA**

The Thirteenth Annual Meeting and Banquet of the Philadelphia Branch of the American Electro-Platers' Society, was held on Saturday, November 19th at Mosebach's Hall, Girard Avenue and Thirteenth Street.

The technical session which opened at 3:30 P. M., was presided over by Willard M. Scott, U. S. Arsenal, Frankford, Pa. The program was as follows:

Meeting called to order by Willard M. Scott.

"Address of Welcome," by Geo. Gehling, president of Philadelphia branch and supreme secretary A. E. S.

"The Chromium Situation from an Outside Standpoint," by Charles H. Proctor, Associate Editor of the METAL INDUSTRY.

"Chromium Plating," by Dr. Wm. Blum, Bureau of Standards, Washington, D. C.

"The Relation of Polishing and Buffing to Chromium Plating," by P. W. Ellwanger, Chas. F. L'Hommedieu Co.

"The Supreme Society," by the first vice president, Horace H. Smith, Newark branch.

"Cadmium as Used by the Plating Industry," by Hiram S. Lukens, University of Pennsylvania.

"Commercial Cadmium Plating," by Clayton Hoff, Grasselli Chemical Company, New York.

"Application of Electricity to Electroplating," by O. W. Hakanson, Meaker Company, Chicago.

The banquet which was held at 7 P. M., was one of the largest and best affairs ever run by the Philadelphia Branch. The program was of unusual interest and the meeting was one of the most worth while which the members had ever attended.

# Personals

## GUSTAV H. NIEMEYER

GUSTAV H. NIEMEYER

Gustav H. Niemeyer, vice-president of Handy & Harman, silver refiners of New York, was recently elected to the board of directors.

Mr. Neimeyer was born in Chicago in 1883. In 1900 he went with the Standard Metal Company of Chicago, refiners and dealers in gold and silver, who later consolidated with Handy & Harman. He was the first salesman for Handy & Harman and traveled for that firm from 1902 to 1915.

In 1915 Mr. Niemeyer was elected secretary and manager of Charles S. Platt Company, which office he held until 1918, when he was elected vice-president of Handy & Harman.

Mr. Neimeyer is an ex-president of the National Jewelers' Board of Trade; ex-president of Jewelers' 24 Karat Club of New York; vice-chairman of Jewelers' National Crime Committee; chairman of Crime Reduction Committee of the Merchants' Association of New York; vice-chairman of the Jewelers' Co-Operative Bureau; director of the Jewelers' 24 Karat Club; director of the Jewelers' Survey Bureau; director of the Jewelers' Vigilance Committee; a member of the Drug and Chemical Club of New York, and the Essex Fells Country Club of New Jersey. He resides in East Orange, N. J.

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**James Boswell** has been elected secretary of the Standard Brass Casting Company, Oakland, Calif., having formerly been purchasing agent. He will continue to supervise the purchasing department.

**Alfred G. Morency,** formerly president, Northern Indiana Brass Company, Elkhart, Ind., has severed his connection with that firm and organized the Coldwater Brass Company, Coldwater, Mich. Mr. Morency previously was connected with the Morency-Van Buren Manufacturing Company, Sturgis, Mich.

**Dr. W. D. Coolidge,** assistant director of the research laboratory of the General Electric Company, has been awarded the Hughes medal by the Royal Society for "distinguished work on X-rays and the development of highly efficient apparatus for their production." The Hughes medal was first presented in 1913 to Dr. Alexander Graham Bell. Dr. Irving Langmuir, also of the General Electric research laboratory, received it in 1918.

**Dr. Robert J. Anderson**, one of the foremost authorities on the metallurgy of aluminum in the United States, is now connected with the Fairmont Manufacturing Company, at its aluminum rolling mills at Fairmont, West Virginia. Dr. Anderson will have charge of the chemical and physical laboratories of the Company, and will supervise scientific research work, and all chemical and mechanical problems connected with the metallurgy of aluminum sheet production. Dr. Anderson has made a life study of aluminum problems and is an expert of international reputation. He will be assisted by a corps of skilled chemists and engineers.

It is the purpose of the Fairmont Manufacturing Company, under Dr. Anderson's supervision, to render a complete engineering service to the trade in connection with the use of pure aluminum and aluminum alloy sheets.

# Obituaries

## CHARLES F. ATTWOOD

Charles F. Attwood, aged 70, president of the Attwood Brass Works and prominent in Grand Rapids business and industrial activities, died on October 31, 1927, at his home 321 Rosewood Avenue, S. E., Grand Rapids, Mich., after an illness of several months. He had been identified with various manufacturing enterprises in Grand Rapids since coming there in 1893. Mr. Attwood was born in London, England, September 25, 1857. When a boy he accompanied his parents to Ottawa, Canada, where they settled. They later went to Chicago where he was apprenticed to Crane & Company and began his business career in the brass department. Later connections were as a foreman with Weir & Craig, and Harris & Brothers of Chicago. Settling in Grand Rapids, Mr. Attwood became associated with F. J. Harring and opened a brass foundry and machine shop, the second brass works established there. After a few years the firm was dissolved and in 1905. Mr. Attwood and a son established the Attwood Brass Works, a partnership which later was changed to a corporation.

CHARLES F. ATTWOOD

Mr. Attwood was active in fraternal affairs, being a life member of Grand River Lodge No. 34, F. and A. M. and a member of Grand Rapids chapter, No. 7, R. A. M., Tyre council R. and S. M., and DeMolai commandery. He was affiliated with Star camp, No. 5, M. W. A., and held membership in several business and civic organizations.

Surviving are his widow, Mrs. Anne Attwood, a son, Charles E., two daughters, Lillian and Mrs. Byron E. Cook, and four grandchildren.

## JOHN FRANKLIN WADE

John Franklin Wade, aged 67 years, died suddenly on November 7, 1927, at his home on Bellevue Avenue, Bristol, Conn., following illness of one day, with a heart attack. He was born on June 29, 1860, at Tallokas, Brooks County, Ga., the son of Thomas and Mary (Oliver) Wade. His early life was spent on a cotton farm and he attended the schools of the village. In his twenty-first year, not being satisfied with the farm, he went to Florida to search for other employment and for a time worked in the orange groves. In October 1881 he entered the employ of the S. B. Hubbard Company of Jacksonville, Fla., a large wholesale and retail hardware concern. In February, 1884, he traveled to Texas, finally locating in Dallas. Being unable to find employment there in the hardware business, he engaged in farming during the following summer. He returned to Jacksonville where he again entered the employ of the S. B. Hubbard Company. After a few months he accepted an offer with the Drew Hardware Company in that city, where he remained until October, 1885, when he went with Rockwell and Kinnie Company, remaining until they closed out the business in February, 1889.

Mr. Wade came to Bristol in March, 1889, and joined the late Albert F. Rockwell in starting the manufacture of what was then known as the New Departure bell. He started as an ordinary laborer, taking any work that came in hand, with no experience in the manufacturing business. The business was later incorporated as the New Departure Bell Company, until 1896, when the name was changed to its present one, The New Departure Manufacturing Company. He worked from the position of an ordinary laborer to a foremanship and in due course was appointed general superintendent, a position he held until 1904. A German law, which was passed, gave notice that they would protect no foreign patents unless the goods were manufactured in Germany, caused the company to establish a plant in that country, and Mr. Wade was sent to Germany to take charge of manufacturing of New Departure goods in Berlin. He remained there until January, 1910, when he returned to Bristol and was again general superintendent of the local plant until October, 1915, when he was appointed works manager at the rolling mill of the Bristol Brass Corporation. He was at one time director of this corporation and also of The Bryce Manufacturing Company. He was a director also of the Bristol Trust Company.

At the time of his death Mr. Wade was Mayor of Bristol.

## HENRY F. BASSETT

Word has reached us of the death of Henry F. Bassett, President of the Taunton-New Bedford Copper Company, in Taunton, Mass., October, 1927.

Mr. Bassett was born in Taunton in 1851, the son of the late Charles J. H. Bassett and Martha (French) Bassett.

Upon leaving school he entered the employ of the Taunton Locomotive Works later serving for four years as superintendent of the Taunton Water Department. He then went to Appleton Wis. in 1880 forming there the firm of Morgan & Bassett which developed an extensive foundry and machine shop plant. In 1885 he was called back to Taunton to assume the treasurership of the Taunton Copper Company afterward with the Revere Copper Company and New Bedford Copper Company, which became the Taunton & New Bedford Copper Company, of which at the time of his death he was president and general manager

## C. B. MANVILLE

Charles B. Manville, who founded the Johns-Manville Company, died, during November, 1927, in Pleasantville, N. Y., aged 93. He discovered the fireproofing qualities of asbestos and founded the industry in 1858 in Milwaukee, Wis. Johns-Manville products are now used throughout the world in industrial plants and almost without exception in metal working factories.

## FRANK A. GRING

Frank A. Gring, died recently at the age of 56. For seventeen years he was president and general manager of the Franklin Brass Foundry Company, Reading, Pa. Mr. Gring was born and raised in Reading, and was associated with the Reading Hardware Company for twenty-three years. He founded the brass company in 1908.

# NEWS OF THE INDUSTRY

## Industrial and Financial Events

### FORM COPPER INSTITUTE

The organization of the Copper Institute was effected November 10, 1927, by leading American producers of the red metal. Its aim will be to promote closer collaboration and advance the interests of the industry.

The organization of the new body will be similar to that of the American Iron and Steel Institute, the American Petroleum Institute and others. It will co-operate with the Copper and Brass Research Association and the American Bureau of Metal Statistics. The minutes, constitution, by-laws and other relative documents have been forwarded to the United States Attorney General and to the Federal Trade Commission.

Cornelius F. Kelley, president of the Anaconda Copper Company, has been elected chairman of the Executive Committee, and F. H. Brownell, first vice-president of the American Smelting and Refining Company, will be president. The vice-presidents will be Stephen Birch, president of the Kennecott Copper Corporation, and Walter Douglas, president of the Phelps-Dodge Corporation. R. R. Eckert will be secretary and treasurer.

The first object of the Copper Institute will be the assembling and distribution of full information regarding the consumption and sale of copper, as well as the study of costs of producing the metal. Concerning the conditions facing the consumption and sale of copper in foreign countries, it is expected that Copper Exporters, Inc., will play an important role. The institute itself will conduct wide surveys in the United States covering the same points.

In order to establish a uniform cost accounting system for the whole United States, member companies will be requested to turn over all their cost statements to Price, Waterhouse & Co., accountants, of 56 Pine street, New York. The accountants will work out all the statements on a uniform basis, drawing up at the conclusion of this task a composite statement which will be given to the institute.

The composite statement will show the quantities of copper produced, in fixed periods, and at what cost per pound of refined metal. The statement drawn up by the accountants will apply strictly to composite tonnages, so that facts regarding any one company will not be made available to the others. The supplying of the necessary information by the members will be purely voluntary.

### GILBY WIRE BUYS PLANT

The Gilby Wire Company, now operating at 123 Jackson street, Newark, has purchased the plant formerly operated by the F. N. DuBois Company at 162 Riverside avenue and will move to the North Newark location January 1st.

The plant consists of 30,000 square feet of one-story modern mill construction buildings of brick and steel. The purchase included a modern machine shop with tools, etc., also a nickel-plating and polishing plant and a complete lead pipe plant for the manufacturing of traps, straight pipes and bends. The foundry equipment, which consists of electric and gas furnaces and many other of the latest foundry devices, is ready for operation.

The new owners will sell the lead pipe plant, plating and polishing departments, and such other machine and tools not essential in their business, but the foundry with its furnaces and equipment will be kept intact for the production of nickel-chromium castings for high temperatures and acid-resisting work, in addition to the activities carried on in the Jackson Street quarters.

### STAR PIN BUYS ALLING

The Star Pin Company, of Derby, Conn., which some time ago absorbed the New England Pin Company of Winsted, has purchased the hair pin making business of George E. Alling & Sons, also a Winsted industry. The Alling company, which also manufactures brass cup hooks, will continue business in that line exclusively.

### INCORPORATIONS

**C. S. Rush, E. J. Averman** and **Ralph R. Wood** announce the formation of a corporation which will be known as the **General Bronze Company**, 3212 Smallman Street, Pittsburgh, Pa. They will specialize in the manufacture of 5, 10 and 15 per cent phosphor copper, copper, bronze and brass castings for blast furnaces, tin and sheet mills, hoop and rod mills, plate mills, machinery builders, ship builders, railroads. "GBCO" grade A and B babbitt metals.

The **New Jersey Valve and Casting Company, Inc.**, 224-34 Clay Street, Paterson, N. J., has been organized to manufacture high and low pressure valves, cocks and fittings for steam, water and gas, and brass, bronze and aluminum castings. It is prepared to receive specifications for these types of work. The following departments are operated: brass machine shop, tool room, tinning, soldering, polishing.

### BRONZE COMPANIES MERGE

Negotiations for a merger of the businesses of the John Polachek Bronze and Iron Company, Inc., Brooklyn, N. Y., and the Renaissance Bronze and Iron Works, Inc., Long Island City, N. Y., have been completed and a new company, to be known as the General Bronze Corporation, will take them over as of October 31. An offering of 7 per cent. convertible preferred stock and common stock will be made soon.

### BALTIMORE TUBE COMPANY OFFICERS

Charles E. F. Clark, vice-president of the Baltimore Tube Company, Baltimore, Md., has been elected chairman of the Board of Directors to succeed the late John M. Jones. C. S. Inglis, who will remain as treasurer, was elected president, also in succession to Mr. Jones. R. S. Stringer, M. J. Callanan and E. G. James were elected vice-presidents. Mr. James remains as secretary as well.

### TAUNTON-NEW BEDFORD DIVIDEND

Taunton-New Bedford Copper Company declared regular quarterly dividend of $2 a share, and extra of $8 a share, both payable November 30 to stock of record November 17. This will bring total payments for 1927 up to $16 a share. In 1926 an extra of $6.50 a share was paid.

Taunton-New Bedford Copper Company is a manufacturer of sheet copper and brass with plants in Bristol County, Mass. The company's sold capital liability is the issue of 12,000 shares of $100 par stock.

Edward H. R. Revere has been elected president to succeed Henry F. Bassett, deceased.

### GENERAL CABLE OFFICERS

At the first meeting of the board of directors of the General Cable Corporation, New York, Walter Robbins was elected president. Joseph W. Marsh was chosen chairman of the board; W. C. Hall became treasurer; G. C. Thompson, comptroller; G. K. B. Wade, special signing vice-president; Afred A. Cook, general counsel, and H. T. Dyett, Walter F. Field, George A. Jacobs, P. H. W. Smith and Roger Strauss, vice-presidents.

The executive committee is composed of F. H. Brownell, chairman, and Messrs. Dyett, Field, Jacobs, Robbins and Smith, together with the chairman of the board as ex-officio member. Directors are: C. Albrecht, H. W. Barnard, F. H. Brownell, H. T. Dyett, Walter Field, Edwin A. Fish, Samuel L. Fuller, W. C. Hall, Charles D. Hilles, George A. Jacobs, C. J. Marsh, J. W. Marsh, Clifton M. Miller, F. M. Potter, Walter Robbins, P. H. W. Smith and Roger Strauss.

## INTERNATIONAL NICKEL EARNINGS

| | Nine Months Sept. 30, 1927 | Nine Months Sept. 30, 1926 |
|---|---|---|
| Earnings | $6,313,491.68 | $6,270,188.79 |
| Other Income | 80,263.96 | 127,567.70 |
| TOTAL INCOME | $6,393,755.64 | $6,397,756.49 |
| Administration and General Expense. | 452,597.59 | 406,514.96 |
| Reserved for Federal and Franchise Taxes | 475,812.91 | 670,468.13 |
| NET OPERATING INCOME | $5,465,345.14 | $5,320,773.40 |
| Depreciation and Depletion | 1,201,254.29 | 1,151,884.62 |
| Orford Works Property Expense | 80,771.92 | 79,765.92 |
| Profit | $4.183,318.93 | $4,089,122.86 |
| Dividends, Preferred | 401,067.00 | 401,067.00 |
| Common | 2,510,076.00 | 2.510,076.00 |
| BALANCE | $1,272,175.93 | $1,177,979.86 |

## ALUMINUM ALLOY FOR CABLES

The European press has announced a new aluminum alloy called Aldrey, marketed by Aluminum Industrie A. G., Neuhausen, Switzerland. It is said to have high strength and high electrical conductivity, and to be superior in these respects to pure aluminum cable and to aluminum cable with a steel core. It can compete with copper for the manufacture of high-tension transmission wire. Its composition is reported to be 0.5 to 0.6 per cent silicon, 0.3 per cent iron, and 0.4 per cent magnesium, with the remainder aluminum. High conductivity is given by the correct combination of cold work and heat treatment. Its physical properties in comparison with other electrical transmission materials are given as follows:

| | Copper | Aluminum | Aluminum with Steel Core | Aldrey |
|---|---|---|---|---|
| Specific gravity | 8.95 | 2.70 | 3.67 | 2.70 |
| Tensile strength | 60,000 | 26,000 | 53,000 | 47,000 |
| Elongation | 2 to 3 | 2 to 3 | 2 | 5 to 7.5 |
| Conductivity (times that of mercury) | 57 | 35 | 27.6 | 31 |

## ALUMINUM CARS AND PISTONS

The Aluminum Company of America will furnish 400,000 pounds of aluminum for the 120 cars which will be built for the Chicago & Northwestern Railroad, according to a report in the daily press.

The Standard Steel Car Company, the Pullman Car and Manufacturing Company and the American Car and Foundry Company will manufacture the cars.

The Aluminum Company of America will make the pistons for the new Ford cars, according to a newspaper report.

Ford formerly used cast iron pistons, but it is stated that in the new cars he has followed the trend in the industry toward aluminum pistons.

## ALUMINUM SAFETY CONTEST

Employees of the Niagara Falls rolling mill plant of the Aluminum Company of America are winners of a three months' safety contest held among all branch plants of the company in the United States and Canada, it was announced today. As a result an appropriate trophy has been awarded to that plant's employees and will be held there permanently unless some other branch of the company manages to win it by establishing a better record.

## COPPER CONSUMPTION

Consumption of copper in some of the important copper requiring industries of the United States in the third quarter of the current year is estimated by the American Bureau of Metals statistics as follows: Electric manufactures, 48,000 tons; automobiles, 24,600 tons; buildings, 12,800 tons; manufactures for export, 14,900 tons. Total, 100,300 tons.

## NEW LIGHT ALLOY

According to press reports, an alloy, which is known as "Neonaleum," was invented by Dr. Max Wurmbach, who occupies the chair of metallurgy at the University of Munich, Germany. Dr. Wurmbach, who is president of the Neonaleum Company of Zurich, Switzerland, organized to manufacture the product, says that his discovery is the most important since the discovery of duralumin in 1907. According to him, a piano made of the alloy would be so light that it could be picked up and carried about by a small boy.

His product can stand a 500-degree heat without being affected, and it is possible to melt it over in cases where it has been broken.

## ALUMINUM IN SPEED BOAT

The speed boat Fan Tail piloted by Mrs. William B. Leeds, the former Princess Xenia of Greece, and carrying twenty-four persons, cut through the waters of Long Island Sound at more than sixty knots, an unofficial world's record for such a load.

This speed has been made possible, according to Mr. Plumm, the designer, by the application of a principle better understood in aerodynamics than in naval architecture. At the stern of the boat and several inches below the surface is the secret of its speed, an aluminum horizontal stream-lined adjustable plane, shaped much like a whale's flukes.

## ART METAL EXHIBIT

The comprehensive exhibition of Danish Applied Arts that opened at the Brooklyn Museum of Art, Brooklyn, N. Y., on November 15, 1927, is an interesting demonstration of how another of the Scandinavian countries has raised its decorative arts to a high level of artistic merit as well as fine hand and machine workmanship.

This has been accomplished by co-operation between manufacturers and men whose work in the fine arts has been outstanding. They have proved that if a manufacturer starts out with a good design he can turn out truly beautiful things in quantity just as easily as he can produce commonplace ones and at not at impossible prices. The result is these fine, useful objects readily find their way into homes all over Denmark, to say nothing of foreign countries where the Danish work has become familiar.

Among the exhibits are the following:

SILVER AND GOLD

| | | |
|---|---|---|
| Trays | Fruit baskets | Candlesticks |
| Bowls, with and without covers | Bonbonnieres | Tea-pots |
| | Desk sets | Inkstands |
| Cups | Lamps | Jugs |
| Cigarette boxes | Scent bottles | After-dinner coffee set with creamer and sugar bowl |
| Cigar boxes | Hand mirrors | |
| Cocktail shakers | Flat silver | |

Complete ladies' toilet set, including: comb, brush, powder-box, scent bottle, nail scissors, jewel box, comb tray, hand mirror, hair pin box, clothes brush, hat brush, shoe horn, button hook.

PEWTER

Complete dinner set, including: tureens, vegetable dishes, gravy boat, sauce boat, bread dish.

| | | |
|---|---|---|
| Vases | Marmalade jars | Bowls |
| Wine coolers | Tea caddies | Cups |
| Sugar bowls | Candlesticks | Coasters |
| Plates | Sconces | Ash trays |
| Scent jars | Wall mirrors | Bonbonnieres |
| Trays | Salvers | Cigarette boxes |

JEWELRY

| | | |
|---|---|---|
| Rings | Match boxes | Small boxes mounted in silver and gold and with precious stones |
| Brooches | Table bells | |
| Purse tops | Cruet stands | |
| Pendants | Sugar spoons | |
| Buckles | Cigarette boxes | |

BRONZE

| | | |
|---|---|---|
| Bowls | Jars | Candlesticks |
| Bonbonnieres | Cigarette boxes | Candelabrum, 5 and 7 branch |
| Ash trays | Paper cutters | |
| Vases | | Seals |

# Business Reports of The Metal Industry Correspondents

## NEW ENGLAND STATES

### WATERBURY, CONN.

DECEMBER, 1, 1927.

No change in the working schedule is contemplated at the Waterbury and Torrington plants of the **American Brass Company, Edmund H. Yates,** secretary of the company states with reference to the curtailment of the schedule in some of the departments of the Ansonia plants. The company's plants here and in Torrington are working 55 hours a week, and are expected to continue on this schedule, he states.

President **E. O. Goss** of the **Scovill Manufacturing Company** and officials of the **Chase Companies, Inc.** state that no changes in the schedule are contemplated at their plants. The main plants are working 55 hours a week. The **Noera Manufacturing Company** and the **Waterbury Manufacturing Company,** branches of the Chase Companies, are working nine hours a day six days a week.

President **E. O. Goss** of the **Scovill Company,** as chairman of the power committee of the New England Council, broadcast over the radio his address at the conference held in Springfield, Mass., last month.

An agreement has been signed between the city and the Chase Companies, Inc., whereby the latter gives the former the right to install sewage pumping stations on its property near the Naugatuck River in Waterville. No monetary return is exacted but the Chase Companies receive in return the right to erect a factory building over a sewer line that the city is building.

**Harry B. Dow,** assistant secretary of the **Waterbury Clock Company** and president of the local Chamber of Commerce, was elected first president of the newly organized **Naugatuck Valley Chamber of Commerce** here last month. Delegates were present from most of the Chambers in the valley. **Frederick S. Chase,** president of the Chase Companies, Inc. and a director of the state Chamber, entertained the delegates at dinner. Other officers elected include: Vice President, **William H. Clark,** superintendent Ansonia branch, American Brass Company; treasurer, **C. S. Boies,** president of the Seymour Trust Company; secretary, **F. Raymond Darling,** secretary of the Derby and Shelton board of trade. The objects outlined are: Beautification of the Naugatuck river valley and elimination of the river pollution, aid to and development of industries in the valley, and general co-operation. Although delegates from Bridgeport, Thomaston, Torrington and Winsted were not present those cities will send delegates to the next meeting.

Officials of the **Andrew C. Campbell Company** of this city, a subsidiary of the **American Chain Company** of Bridgeport, have incorporated a new local concern, the Naugatuck Valley Coke Corporation, capitalized at $1,000,000. It will take over and manufacture apparatus now being made by the Campbell Co. which is designed for use by gas and coke producing concerns. The apparatus also includes burners for domestic and industrial combustion of gas and oil combined. It is also believed that the new company will eventually manufacture gas to sell to the local gas company. The company plans to erect a plant in the near future. The move is said to be linked up with the fight **Walter B. Lashar** of Bridgeport has recently been making to prevent the stockholders of the Waterbury Gas Company from selling their stock to a subsidiary of the American Commonwealths Power Company. Mr. Lashar is the head of the American Chain Company and also of the Bridgeport Gas Company. Mr. Lashar, David S. Day of Bridgeport and Alfred A. Hall, manager of the Andrew C. Campbell Company are the incorporators.

**Chauncey P. Goss,** superintendent of the rolling mills of the **Scovill Manufacturing Company** is associated with Gen. Lincoln C. Andrews, former prohibition head, in the formation of the Guardian Investment Trust of Hartford. Mr. Goss is one of the trustees.

The local office of the **International Silver Company** states that the local plant has had a normal business during the year and that the outlook for next year is bright. The company has 14 plants, of which the most are in Meriden, Bridgeport, Wallingford and Waterbury. The production for the year probably will not attain the high figure of 1926, it is said.

The **Bristol Company,** in conjunction with the Y. M. C. A. is conducting two classes in blue print reading, shop sketching and elementary electricity. Enrollment is open to all employees of Naugatuck concerns. Already 40 have enrolled.

The **Chase Brass & Copper Inc.,** selling subsidiary of the Chase Companies, Inc. has started an advertising campaign in The Saturday Evening Post. It consists of a series of full page advertisements sketching the career of the "Wallops Family," George Wallop, his wife, Clara and their daughter, Lily. Its intent is to show the large part that brass products play in the household and in family life.—W. R. B.

### BRIDGEPORT, CONN.

DECEMBER, 1, 1927.

**George S. Hawley** of the **Bridgeport Gas Company** was elected for the fourth time as president of the local manufacturers association at the annual meeting last month. Executive board members elected included: **S. H. Bullard** of the Bullard Machine Tool Company, **W. C. Bryant** of the Bryant Electric Company, **L. A. Nothnagle** of the International Silver Company, **Herman K. Beach** of the Bridgeport Metal Goods Manufacturing Company, **Willis F. Hobbs** of the Bridgeport Hardware Manufacturing Corporation, **H. B. Houghton** of the Bridgeport Casting Company, **H. C. Ives** of the Ives Manufacturing Company, and **H. D. Strong** of the American Chain Company.

Other present members of the executive committee are: **C. E. Dietz** of the Bridgeport Brass Company, **S. K. Becker** of the U. S. Aluminum Company, **Malcolm Farmer** of the American Tube & Stamping Company, **C. H. Graesser** of the Manning, Maxwell & Moore Company, **W. P. Hutchinson** of the Sprague Meter Company, **P. E. McKinley** of the Hemco Electrical Manufacturing Company, **William J. Grippin** of the Artistic Bronze Company, **M. L. Waterman** of the Singer Manufacturing Company, **W. Steward Clark** of the General Electric Company, **Harry G. Specht** of the Bassick Company, **John H. Collier** of the Crane Company, **R. G. Farrell** of the Bridgeport Screw Company, **Harold C. Rood** of the Red Star Company and **L. H. White** of the Columbia Phonograph Co.

The estate left by **Frederick J. Kingsbury,** former chairman of the board of the Bridgeport Brass Co. totals $2,156,000 according to the inventory filed in probate court in New Haven last month. Under the terms of the will the income from the entire estate is to be paid by the trustees to Adele T. Kingsbury, his widow and on her death will revert to his children, Frederick J. Kingsbury, 3rd and Mrs. Richard C. Sargent. The Y. M. C. A. receives a legacy of $15,000.

Business conditions in Bridgeport last month were a little advanced over the same month last year. Building permits show an increase of $30,000 over the same month last year. Employment in the factories was better the last month than during the previous recent months.—W.R.B.

### CONNECTICUT NOTES

DECEMBER, 1, 1927.

**HARTFORD.**—Announcement is made of the coming merger of the **Underwood Typewriter Company,** whose main plant is in this city and which has another plant in Bridgeport with the **Elliott-Fisher Company.** A new company, the **Underwood-Elliott-Fisher Company** will be formed which will issue 242,000 shares of stock in exchange for the outstanding stock of the two existing companies.

**Pratt & Whitney Aircraft Company** has received a contract from the Navy Department for the manufacture of 346 airplane engines, totalling over $3,100,000. It is now completing an order from the Navy for 200 such motors, of which it has delivered 175.

**NEW BRITAIN.—Landers, Frary & Clark** is working now at capacity, **H. T. Burr,** the secretary reports, although during the first nine months of the year production was slightly under that for the corresponding period for 1926. The com-

pany completed a large addition to its plant recently and all available floor space is now used. It employs between 4,300 and 4,500 men.

**Stanley Works** are now operating on a slightly curtailed scheduled compared to the same period last year but business for the entire year has been very fair, according to President **C. F. Bennett.** Conditions point to improvement. The production this year will run considerably ahead of pre-war years and will indicate a steady growth for 15 years if the irregular years during and after the war are discounted.

The Chamber of Commerce reports a decrease in building permits this month compared to the same month last year amounting to about $100,000 due to the fact that no large buildings were started during the month.

**BRISTOL.**—The **Manufacturers Association** of the state met here Nov. 28 at the New Departure Manufacturing Company and had as its prnicipal speaker, Comdr. **Richard E. Byrd,** North Pole and trans-Atlantic flyer. Governor **John H. Trumbull,** president of the Trumbull Electric Company, was the toastmaster. The officers of the association, President **E. Kent Hubbard,** Vice President **John H. Goss** of the Scovill Manufacturing Company of Waterbury and Secretary **Robert S. Buell** of Hartford, were re-elected.

The **American Silver Company** is reported to be enjoying excellent business and production is at capacity. It is employing its regular working force and operating on a full time basis. Production for the year will exceed that for 1926, officials predict.

**STAMFORD.**—The **Segal Metal Products Company** of this city and New York has closed its local plant and moved its business to its plants in New York and Brooklyn. Equipment of the local plant will follow shortly and the local plant sold. It formerly employed about 50 men here.

**Yale & Towne Manufacturing Company** reports for the quarter ending Sept. 30, net income of $427,609 after depreciation and federal taxes equivalent to $1.06 a share earned on 409,000 shares of stock. This compared with $1.32 a share in the preceding quarter and $1.35 a share for the third quarter in 1926. The net income for the nine months ending Sept. 30 was $1,487,897 after above charges or $3.71 a share against $4.33 a share for the first nine months of 1926.

**Magazine Repeating Razor Company** of Stamford has called a stockholders meeting to vote on an increase of 15,000 shares of preferred stock and the creation of 100,000 shares of deferred stock on which no dividends will be paid until preferred and common dividends have been paid. Walter B. Lashar of Bridgeport and others have agreed to take the deferred stock issue and 6,250 shares of the preferred.

**DERBY.**—The **Chromium Process Company,** recently incorporated for $50,000, has secured a factory location in the plant of the old Maxim Munitions Company on Housatonic avenue. The concern was persuaded to come here by the Derby-Shelton board of trade. It will be operated under the management of Norman Tice of New Haven who had nine years' experience in electroplating. Operations will start within a few days.

**TORRINGTON.**—**G. E. Hammann,** treasurer of the **Progressive Manufacturing Company** of this city, has been elected one of the four new directors of the Connecticut Manufacturers Association to serve one year. He will represent Litchfield county on the board.

**Fred Graham** of the American Brass Company, **James Kelley** of the Union Hardware Company and **Einar Palm** of Turner & Seymour have been appointed by the Industrial council to arrange athletic and social programs for the factory employees of the city during the winter.

**WINSTED.**—Business conditions in the city are reported very good at present by the local Chamber of Commerce. There is little unemployment.

Negotiations are underway for the transfer of the **Carter & Hakes Company** factory to the **American Safety Signal Company,** according to **James Vita,** an officer in the former concern. **Charles L. Batlouney** of the latter company has secured an option on the plant and states his intention of exercising it. It is expected that operations will start with 50 employees.

**THOMASTON.**—The **Seth Thomas Clock Company** of this place has gone on a 50 hour week shedule. For the past several months it has been on 40 hours a week. The **Plume & Atwood** brass plant here is now operating 55 hours a week.

**ANSONIA.**—The working schedule of most of the departments of the local plants of the **American Brass Company** has been cut from 10 hours a day except Saturday with a five hour day to eight hours a day for five days, or 40 hours a week. Some of the departments are still on a 55 hour week basis.

**WESTPORT.**—One of the oldest button factories in the state will lose its character as the result of the sale of the former plant of the **Saugatuck Manufacturing Company** to **James Restaino.** He intends remodelling it for a storage garage repair shop and warehouse.—W. R. B.

## MIDDLE ATLANTIC STATES

### NEWARK, N. J.

DECEMBER, 1, 1927.

The **Garod Radio Company,** of Main and Mill Streets, Belleville, N. J., near here and its president, **Harry M. Pitkow,** have been restrained by Federal Judge Runyon from intringing radio patents held by the **Hazeltine Corporation** of Jersey City, N. J., and owned by **Louis A. Hazeltine.** The order was issued when the Garod Company and Pitkow failed to appear in court to show cause why the injunction should not issue. The Garod company is the successor to the Garod Radio Corporation, which went into the hands of a receiver several months ago.

Due to increased business demands the **Gilby Wire Company,** 123 Jackson Street, Newark, has acquired the plant of the **F. N. DuBois Company,** Newark. The property contains three acres of land overlooking the Passaic river with a frontage of 740 feet on the state boulevard and contains 30,000 square feet of one story mill construction buildings. The purchase included a modern machine shop, with tools and a metal plating and polishing plant for the manufacture of traps, straight pipes and bends. The foundry equipment consists of electric and gas furnaces. The buildings were completed last year by the DuBois company, which successfully manufactured plumbing fixtures and supplies in New York City for seventy years. After operating for a few months it was decided to retire from business and dispose of the plant and equipment. The new owners will sell the lead pipe plant, plating and polishing departments and such other machines and tools not needed in their business, but the foundry will be kept intact.

The following Newark concerns have been chartered here: **Metal Tone Manufacturing Company,** manufacture toys, $20,000. **United States Chemical Laboratories, Inc.,** chemicals, $350,000. **Motor Vest, Inc.,** metal products, 2,000 shares no par. **Electric Hedge Clipper, Inc.,** clippers, $100,000. **Atlas Chemical Company,** of New Jersey, chemicals, $125,000. **General Chemical Products Company,** chemicals, 100 shares. **Alc, Inc.,** manufacture lubricating devices, $125,000.—C. A. L.

### TRENTON, N. J.

DECEMBER, 1, 1927.

Overtures for the acquisition of the J. L. Mott Company plant here by a large pottery manufacturing corporation are in progress it became known when counsel for the prospective purchasers obtained a week's postponement of the public sale originally scheduled for November 30.

The identity of the interests was not divulged. It was learned that the counsel represents one of the country's leading pottery corporations.

There has been little change in the metal industries here during the past month and some of the smaller manufacturers believe that business is not going to be up to normal during the winter. The **John A. Roebling's Sons Company** is working overtime in some departments and the contract for more than $12,000,000 the concern received recently is expected to keep the works busy for some time. While a good part of the order, which calls for bridge cables, will be turned out at Roebling, N. J., the Trenton plant will get its share.

Trenton metal manufacturers contributed liberally to the $400,000 fund for a memorial building for soldiers and sailors. **Siegfried Roebling,** vice president of the John A. Roebling's Sons Company, contributed $75,000. **Ferdinand W. Roebling** and **William H. Schulte,** of the Trenton Brass and Machine Company were on the executive committee.—C. A. L.

## MIDDLE WESTERN STATES

### DETROIT, MICH.

DECEMBER, 1, 1927.

Production on a contract to provide horn equipment for the new Ford automobiles has been started by the **Sparks Withington Company** of Jackson, Mich., it is announced. Indications that production would reach 125,000 a month within a short time, were made by officials, it is stated. A delivery of 2,500 horns already has been made. The new Ford horn resembles the horn used on the Lincoln car, it is stated. The horn will be placed on the outside of car underneath one of the front lamps.

The **National Porcelain Enameling and Foundry Company** will erect a plant in Detroit, announces the industrial department of the Detroit Board of Commerce. William J. Vodick, who will manage the new plant, is said to have enameled the first porcelain bathtub in this country.

A prediction has been made by **O. B. Miller,** president of the **Mueller Brass Company,** of Port Huron, that his organization will have an output of $12,000,000 worth of finished material annually within the next four years.

A decree granting **George M. Holley,** president of the Holley Carburetor Co. the exclusive right to manufacture and distribute a patented vaporizer used on Ford automobiles and tractors, has been ordered by Judge Leland W. Carr, of Lansing, sitting in the Wayne County Circuit court at Detroit. **George R. Welch,** an automotive engineer, was named defendant in the Holley suit, filed January 19, last. Holley testified that in October, 1922, he and Mr. Welch entered into a contract under which Welch was to enter into his employ and perfect the vaporizer. It was agreed, he said, that Holley was to have the exclusive right to manufacture and market the device which was patented in this country November 24, 1925, and subsequently in England and Ireland. Mr. Holley charged that although he paid Mr. Welch a salary and $60,000 in royalties, the latter permitted other manufacturers to make and sell the vaporizer. When Mr. Holley started his suit, it is stated, he obtained an injunction restraining Mr. Welch from permitting the vaporizer to be made by any one else.

The **Bohn Aluminum & Brass Company** reports net profits of $879,083 after all charges, including federal taxes, for the first nine months of last year which was equal to $2.42 a share on the 346,307 shares then outstanding. The company's sales are running about ten per cent ahead of a year ago, it is announced.

But little change is noted in the brass industry in this territory during the last month. Most of the plants are just about holding their own and there is nothing in sight to indicate improvement until after January first.

The much expected improvement anticipated from the automobile industry has not yet made its appearance, and it is doubtful if anything unusual comes from this source for a considerable time.—F. J. H.

### MILWAUKEE, WIS.

DECEMBER 1, 1927.

Plants manufacturing aluminum products have recently increased their activities since the price on all standard grades of aluminum ingots and alloys with the exception of No. 112 alloy have been reduced 1 cent a pound, equivalent to $20 a ton. The reduction, which was announced by the **Aluminum Company of America,** went into effect immediately and the result was noticeable wherever aluminum products are made. The **Aluminum Goods Manufacturing Company** of Manitowoc, Wis., one of the largest plants of its kind in the middle west, at once increased its output.

The **Beaver Dam Pattern Company** of Beaver Dam, Wis., was organized for the manufacture of metal patterns, with a capital of $7,000. E. J. Beers, J. J. Kumba and F. P. Bartell are the incorporators.

A storage shed will be built by the **Western Metal Specialty Company** of Milwaukee. It will be a one-story, fireproof building, 40 feet by 60 feet.

The **Building Maintenance Company** of La Crosse, Wis., was incorporated by George L. Jackwitz, Alfred C. Severson and Mabel Jackwitz, for $5,000. The company will do bronzing, plating and covering of metal steeples and roofs.

The Oshkosh, Wis., factory building of the **Wisconsin Iron and Metal Company,** will be completely rewired before the middle of December. The old wires have been in the factory since it was built and it was found necessary to replace them.

**William H. Wasweyler,** president of the **Milwaukee Brass Manufacturing Company,** drew favorable comment from numerous experts all over the country on his acre plot of dahlias. Approximately 600 plants were grown of every color and description. Mr. Wasweyler is an expert dahlia grower, this being his especial hobby and his summer home at Lake Pewaukee, Wis., is yearly visited by experts from all parts of the country.—A. P. N.

## OTHER COUNTRIES

### BIRMINGHAM, ENGLAND

NOVEMBER, 21, 1927.

Most of the Birmingham metal trades continue busy, and by far the most active is the department devoted to shop fitments and architectural decoration. These firms have all had a very busy year, the reconstruction of shops having altogether exceeded past experience.

There is an increasing preference for nickel hardware of various descriptions. The largest concern in the district engaged in this trade is making substantial enlargements of buildings and plant. New uses for nickel are continually being found necessitating the storing of special machines. The great recommendation of the metal is its non-corrosive character, which makes it suitable for a variety of domestic uses and recommends it for certain machine parts.

Aluminum bronze is coming into favor on account of its great tensile strength, and its ability to resist alternating stresses. Its rather attractive yellow coloring commends it for the manufacture of cheap jewelry, although for this purpose Birmingham has not followed the example of Switzerland where all sorts of ornamental articles are made from this material. Its ability to resist seawater is a strong recommendation, increasing its use for propellers and ship fittings of various descriptions. The metal can be improved by alloying with nickel, iron and manganese, and it is very susceptible to heat treatment. It is coming into vogue for die-casting.

The jewelry trade has had a smart revival during the Autumn, though this revival is very much of a seasonal recurrence, being invariably experienced during the Autumn. The cheap jewelry business has extended enormously, large shipments being made to various Colonies. But a very important trade has developed in connection with the big multiple shops established in various parts of the country, who get their supplies from Birmingham at remarkably low prices. In connection with the silver and electroplate trades pewter has returned to favor, and for the past twelve months has been a most important department. To some extent, old patterns are being followed. South Africa and Canada are very good customers.

The revival of shipbuilding has brought some good orders to the plate and cutlery trade of Sheffield, and the outlook is brighter there than for a long time past. In addition, good orders are coming from hotels and restaurants and there is a very good demand for ordinary plated hollowware. Ex-

tensive contracts are in hand for cheap goods needed for the Christmas season, but silver ware is also selling very well, spoons and forks being produced in large quantities.

The rollers of brass and copper tubes have become very busy, especially for shipbuilding requirements. Several important vessels are getting their non-ferrous equipment from leading firms in Birmingham. Side by side with this demand the preference for brass tubes for electric water conveyance makes a steady expansion. London having come forward in the use of this metal in preference for lead. For a long time, the Metropolis lagged behind, but now shows as strong a liking for brass as the leading provincial towns.

The galvanized hollowware trade shows steady improvement with a very hopeful outlook. Several of the hardware industries use galvanized tanks as containers. The chief complaint is that orders are kept back until the last moment and are then placed practically for prompt delivery, which causes inconvenience, while order books are poorly furnished. Prices tend to fall.

London silversmiths are reported to be scarce with the result that it is difficult to obtain a sufficient supply of high-class craftsmen. One of the results of this is the diversion to Sheffield of a considerable amount of business, the necessary supply of workmen being available in that city.—J. H.

## BUSINESS ITEMS—VERIFIED

The **Egyptian Lacquer Manufacturing Company,** Los Angeles, Calif., is erecting an addition to its stock room, which will cost approximately $5,500.

The **Brooklyn Edison Company,** Brooklyn, N. Y., to serve its over 700,000 patrons, has built a distribution system of copper wire weighing over 35,000,000 pounds.

The **Cowles Detergent Company,** formerly at Euclid-East 102nd Street, Commonwealth Building, Cleveland, Ohio, is now located at 7016 Euclid Avenue, Cleveland.

**Pacific Abrasive Supply Company,** San Francisco, Calif., distributor of the Carborundum Company in California, of abrasives and refractory material for the Pacific Coast, is erecting a two-story building to cost $31,000.

The **Lincoln Electric Company** announces the transfer of R. P. Nick from the Baltimore, Maryland, office to the Lancaster, Pennsylvania, office, where he will be in charge of the sale of "Linc-Weld" motors and "Stable-Arc" welders.

The **Lincoln Electric Company,** Cleveland, Ohio, announces the appointment of R. M. Plympton as salesman in charge of consumer motor business in Chicago. Mr. Plympton will work under the direction of R. D. Malm, Chicago district manager.

**Sloan Valve Company,** Chicago, Ill., has awarded general contract for a one-story power house addition. W. E. Sloan is president. This firm operates the following departments: brass foundry, brass machine shop, tool room, polishing, grinding room.

**General Ceramics Company,** New York, has opened a district sales office at 208 S. La Salle Street, Chicago, Ill., in charge of Robert S. Beecher. Mr. Beecher was for several years located in New York as sales manager of the company's chemical stoneware division.

The **Henter Corporation,** Silver Creek, N. Y., a new company, has leased a portion of a local building and will engage in the manufacture of die cast specialties. This firm will operate the following departments: casting shop, plating, polishing, lacquering, grinding room.

**L. A. Myers, Jr., Inc.,** 139 Ogden Avenue, Newark, N. J., manufacturer of metal products is having plans prepared for a two-story, 78' x 90' factory. Estimated cost $40,000. This firm operates the following departments: tool room, brazing, plating, stamping, soldering, polishing, lacquering.

The **Marine Wire Company,** Muskegon, Mich., is pushing construction on a new mill at Anderson, Ind., for the production of copper magnet wire and it is purposed to have the plant ready for service early in December. It will cost in excess of $85,000 and will be operated as a branch.

**Worthington Pump and Machinery Corporation,** New York, have centralized their Diesel engine building activities at the Snow Works, Buffalo, and have discontinued operation of the Blake and Knowles Works at Cambridge, Mass. The Blake-Knowles pumps are now built at their Blake & Knowles Works at Holyoke, Mass.

**Cramp Brass & Iron Foundries Company,** Philadelphia, has plans under way for an enlargement of its nonferrous and electric furnace divisions and already has increased its sales personnel. The firm originally was the foundry department of the William Cramp & Sons Ship & Engine Building Company, and was incorporated as a separate entity in April 1927.

The **Delaware Brass and Aluminum Company,** Muncie, Ind., announces the change of the name of the company to the Beckett Bronze Company. There will be no change in the personnel, management or policy of the new company. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, grinding room.

**Northern Blower Company,** Cleveland, Ohio, announces that its "Norblo" trade mark, and the word "Norblo" as applied to its dust-collecting systems, sandblasting equipment and similar air-operated aparatus, has now been registered officially at the U. S. Patent Office. The trade mark has been in use for a considerable number of years by this company, but in view of the increasing amount of foreign and export orders received during the past two years, it has been deemed advisable to secure proper protection in this matter.

The **Canadian Brass Products, Ltd.,** 163 Craig Street, West, Montreal, Canada, has under contemplation the erection of an addition to its plant at Merrickville, Ont. The company requires plating tanks and equipment, foundry and lacquering equipment; also soldering and brazing as there is no gas at the plant. The following departments are operated: brass, bronze and aluminum foundry, brass machine shop, spinning, brazing, plating, stamping, soldering, polishing, lacquering.

The **Contract Plating Company,** Bridgeport, Conn., has leased quarters in the west end plant of the Columbia Graphaphone Company equivalent to three times the floor space that the company now maintains at 36 River Street and 725 N. Washington Avenue. It is the intention of the company to broaden their field by installing an up-to-date polishing, buffing and still-plating department in addition to improving their present ball burnishing and barrel plating apparatus.

**Herbert R. Isenburger, Inc.,** successor to Bondi and Isenburger, Inc., 63 Park Row, New York, manufactures a special solution of its Bonis coating for permanent molds for aluminum castings. The company has recently established an X-ray service for fault analysis. They have made arrangements with Ancel St. John, Ph. D., the well known authority on the industrial uses of X-rays, to supervise all laboratory investigations submitted to their care, and they also will consult on X-ray installations.

The **Amesbury Seat Manufacturing Company,** Amesbury, Mass., manufacturer of hardware for custom automobile bodies, soft metal castings, etc., has acquired the former factories of the Apex Manufacturing Company at Ypsilanti, Mich., and will remodel for a new plant. The Amesbury business will be removed to the new location and operations concentrated at that point. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, soldering, polishing.

## METAL STOCK MARKET QUOTATIONS

| | Par | Bid | Asked |
|---|---|---|---|
| Aluminum Company of America | .. | 136 | 138 |
| American Hardware Corporation | $100 | 78 | 81 |
| Anaconda Copper | 50 | 52⅞ | 53 |
| Bristol Brass | 25 | 8 | 10 |
| International Nickel, com. | 25 | 68½ | 68⅝ |
| International Nickel, pfd. | 100 | 108 | 110 |
| International Silver, com. | 100 | 184½ | 187 |
| International Silver, pfd. | 100 | 126½ | .. |
| National Enameling & Stamping | 100 | 26 | 29 |
| National Enameling & Stamping, pfd. | 100 | 91 | 94 |
| National Lead Company, com. | 100 | 129 | 130 |
| National Lead Company, pfd. | 100 | 136¾ | 138¼ |
| New Jersey Zinc | 100 | 183 | 185 |
| Rome Brass & Copper | 100 | 132 | 142 |
| Scovill Manufacturing Company | .. | 55 | 57 |
| Yale & Towne Mfg. Company | .. | 74½ | 75 |

# Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

DECEMBER 1, 1927

The optimistic views as to business conditions which have been voiced by so many important business factors coupled with the fact that business itself is in satisfactory volume, have contributed to a large extent to dispel the feeling of doubt and uncertainty which was beginning to manifest itself in the metal industry. In addition to this, the long wished for improvement in the business of fabricated brass and copper material was given considerable impetus during November by the improved copper market, and advances in ingot copper prices. Prices on sheets, rods, tubes and wire, both in brass and copper were advanced from ½c to ¾c per pound. Price advances were somewhat irregular. Brass rods, sheets, tubes and wire were advanced only ¼c per pound because of the lower spelter market. Iron pipe size seamless brass pipe was advanced ¾c per pound in order to provide a more equitable margin between cost and selling price. All copper products were advanced ½c per pound, following directly the advance in ingot copper prices.

As a result of this advance a lot of tonnage that had been held up by buyers was placed, and order books, at the mills, are as the result, in a healthy condition. The absence of speculative buying is again noted in this improved price movement, although at this time there appears to be more justification for speculation than for some time past. In the recent past the fluctuations in ingot copper prices destroyed the confidence of the consumer to such an extent that they became very wary of price changes and looked upon advances with misgiving and distrust, which proved to have been justified.

All indications, at this time, however, point to a steady market with an increase in consumption.

The heavy demand for electrical appliances for the holiday trade and the natural expansion in demand for these products have kept the manufacturers of nickel alloy resistance wires busy. The demand for nickel, Monel metal and copper has expanded considerably in this line in the past month or two.

Another important factor in the consumption of brass, copper and Monel metal, namely, the ice machine industry, is beginning to show signs of revival. A survey of the ice cream cabinet trade has developed the fact that the heavy inventories carried by manufacturers of these cabinets have been reduced to a very low point with the result that inquiries are now in the market, and orders have been placed for delivery after the first of the year for next season's need. Orders for Monel metal from this trade have been placed and contracts for more new business are expected to follow in good volume. The producers of Monel metal kept their mills busy without this business for the past several months, and it is expected that the new orders for Monel metal sheets for cabinet tops, added to the present order books will keep the mills running full for several months.

Two of the largest dairy companies supplying milk to the New York markets have placed large orders for nickel sheets and nickel tubing for installations in their creameries. Some large installations of Monel metal in hospital equipment have been made during the past month. Notable items of this kind include the Harper Hospital, Detroit, Michigan; Mayo Clinic, Rochester, Minnesota; Chicago University; the new Girard College, Philadelphia, and the Drexel Institute, Philadelphia, have both equipped their kitchens and laboratories throughout with Monel metal. At the Dairy Show held in Cleveland, practically every manufacturer of dairy equipment showed a full line of solid nickel machines, and at the same show the manufacturers of soda fountains exhibited both Monel and nickel trimmed fountains and accessories. The fact that almost all drug stores are now serving lunches over their soda fountains has opened a wide field for Monel metal in this line.

These and many other similar items have been responsible for the wide-spread demand for both Monel metal and nickel. This branch of the metal industry is in extremely healthy condition with every prospect for continued good business, and taken in conjunction with the activity in the brass and copper trade, it may be said that the fabricating end of the non-ferrous metal industry is well satisfied at this time.

# Metal Market Review

Written for The Metal Industry by R. J. HOUSTON, D. Houston & Company, Metal Brokers, New York

DECEMBER 1, 1927

## COPPER

The copper market tended decidedly higher in November influenced by the continued heavy buying for export and a further reduction in surplus stocks of refined metal. There was also a substantial demand for domestic consumption, but buying for foreign shipment was the principal feature in the market. European demand has developed at an impressive rate.

Constructive measures have gone forward as anticipated, the design of which is to place the copper industry on a sounder and more stable basis. A Copper Institute has been formed to further the interests of the producers of copper. The situation is full of great possibilities, and the outcome is awaited with keen interest.

Stocks of refined copper on November 1 amounted to 83,882 tons, compared with 86,493 tons on October 1, being a decrease of 2,611 tons. Refinery output in October was 124,927 tons and total deliveries to domestic consumers and for export were 127,538 tons. Aggregate shipments exceeded production by 2,611 tons, thus showing a remarkable and healthy outlet for current output. The market closes firm at 13¾ cents delivered to Connecticut Valley points, and 14.05 cents c. i. f. European ports. The undertone is strong and higher prices seem probable.

## ZINC

A change for the better developed in the zinc market recently and the metal is finding a readier demand at improved prices. Business was in fair volume, and producers have booked orders for nearby and future shipment on a slowly rising market. A distinctly soft condition was plainly marked during the first half of the month which sent the East St. Louis price down to 5.60c and the New York basis 5.95c for all shipments up to January. This low level started a fair amount of inquiry, and with the development of further strength all positions advanced on good consuming demand. Recent sales were made at 5.85c for prompt shipment, while deliveries for next year were reported at 5.90c to 5.95c East St. Louis basis. The New York price is quoted at 6.20c for December and 6.22½c to 6.25c for January and February.

## TIN

Conditions in the tin situation improved definitely during the last half of November, and spot Straits sold up to 58½ cents per pound compared with 56 cents on November 10th. The recent drastic decline sifted out the weak spots thoroughly, for the time being, and convinced consumers that the time to purchase on a liberal scale had arrived.

There was an active demand in closing days of the month, with consumers watching the opportunity to buy on signs of even slight reactions. Quotations as this report closes were 58½c to 58⅞c for nearby Straits tin. This is nearly 12 cents per pound below the average price during November, 1926.

## LEAD

Trading in the local market was on an active scale in November. Buyers have covered immediate and future requirements by good sized orders. The New York price has remained steady at 6¼ cents, and producers have been able to get this level uninterruptedly for many weeks without a break. The St. Louis price movement has given evidence of a firmer trend, indicating

that the market is in a position to respond to any favorable developments. Operations by consumers are in good volume, and a heavy demand is looked forward to in 1928. Interest of buyers is obviously keenly alive to whatever developments are likely to influence price changes. Meanwhile the trade recognizes the fact that levels are below the price ruling a year ago.

### ALUMINUM

A steady volume of shipments are going forward to consumers, although new business is not brisk enough to attract special attention. There is a considerable spread between secondary grades and virgin metal. Remelted 98-99% is quoted 22c to 23c, with secondary No. 12 at 17c to 18c. Virgin ingot commercial grade 99% plus is steady at 25c and Metallurgical 94-99% quotes 24c, with No. 12 at 23½c. Imports of aluminum in the first nine months of 1927 amounted to 60,355,425 pounds as compared with 54,371,560 pounds in the corresponding period of 1926. The September imports were specially heavy and totaled 12,086,066 pounds, against 2,726,976 pounds in August and 4,814,508 pounds in September, 1926.

### ANTIMONY

Consumers bought conservatively last month, and prices lately have fluctuated within narrow limits. There was some pressure to sell, with offerings of spot parcels at 10⅜ cents duty paid. The sale of a few distress lots caused a better tone to ensue and the market regained a firmer position at 10⅞ cents. Future deliveries were also available at this price, but transactions were not specially large. China reports a recent decrease in output, and this may be owing in part to low prices and the disturbed conditions prevailing in that country. Imports of antimony during September were 1,209,575 pounds, compared with 1,614,315 pounds in August. Total imports for the first nine months of this year amounted to 20,252,491 pounds, against 22,681,719 pounds for the first nine months in 1926.

### METAL MARKET

The American Smelting & Refining Company has advanced the price of lead to the New York basis of 6.30c per pound. More inquiry and activity in the domestic market.

### QUICKSILVER

The quicksilver situation continues firm, with a normal business and conditions conducive to present quotation of $128 per flask. The foreign market has been strong for sometime past, with recent London price at £23.

### PLATINUM

Recent conditions here and abroad have not produced any special change in the price of refined platinum. This quality continues to quote $65 to $66 per ounce, and there is nothing to indicate an immediate change.

### SILVER

Silver price trend lately developed more firmness. Large purchases by India have been a sustaining factor, and under the stimulus of continued buying for Indian account higher prices were easily obtained. Sales for China account against purchases of yen were also favorable to market improvement. The seasonal yearly demand from India, closely followed by the Chinese New Year requirements, is usually a strong period in the silver market. These factors should begin to operate soon. United States silver output in October amounted to 4,930,000 ounces, against 4,691,000 ounces in September and 5,145,000 ounces in August. The United States monthly average of silver output this year is 4,933,700 ounces. The New York price at present is 57⅞c oz.

### OLD METALS

The substantial rise in prices of several of the virgin metals have acted apparently automatically to strengthen the market for a number of the scrap metals. Inquiries are more numerous and demand better. Buyers are obliged to follow the upward trend in order to secure the necessary shipments desired of brass and copper grades. On other scrap metals the movement has not been specially brisk, but at old rates the opportunities for business occurred from time to time. Values were more stable and more confidence was noted. At the month end buyers were prepared to purchase heavy copper at 11c@11¼c, light copper at 9½c to 9¾c, heavy brass at 7¼c to 7½c, light brass at 5¾c to 6c, new brass clippings at 9¼c to 9½c, heavy lead at 5¼c to 5⅜c, old zinc at 3½c to 3¾c, and aluminum clippings at 18c to 18½c.

# Daily Metal Prices for the Month of November, 1927

## Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

| | 1 | 2 | 3 | 4 | 7 | *8 | 9 | 10 | 11 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Copper c/lb. Duty Free** | | | | | | | | | | | | | |
| Lake (Delivered) | 13.375 | 13.50 | 13.50 | 13.50 | 13.50 | .... | 13.60 | 13.60 | 13.60 | 13.60 | 13.60 | 13.60 | 13.75 |
| Electrolytic (f. a. s. N. Y.) | 13.35 | 13.50 | 13.50 | 13.45 | 13.50 | .... | 13.55 | 13.55 | 13.55 | 13.60 | 13.60 | 13.60 | 13.75 |
| Casting (f. o. b. N. Y.) | 12.85 | 12.90 | 13.00 | 13.00 | 13.125 | .... | 13.25 | 13.25 | 13.25 | 13.25 | 13.25 | 13.25 | 13.375 |
| **Zinc (f. o. b. St. L.) c/lb. Duty 1¼ c/lb.** | | | | | | | | | | | | | |
| Prime Western | 5.80 | 5.75 | 5.75 | 5.75 | 5.70 | .... | 5.60 | 5.60 | 5.65 | 5.65 | 5.675 | 5.70 | 5.70 |
| Brass Special | 5.85 | 5.80 | 5.80 | 5.80 | 5.75 | .... | 5.65 | 5.65 | 5.70 | 5.70 | 5.725 | 5.725 | 5.75 |
| **Tin (f. o. b. N. Y.) c/lb. Duty Free** | | | | | | | | | | | | | |
| Straits | 57.50 | 57.00 | 57.50 | 57.25 | 56.50 | .... | 56.25 | 56.125 | 57.00 | 57.625 | 57.125 | 57.25 | 57.25 |
| Pig 99% | 56.75 | 56.25 | 56.625 | 56.50 | 55.875 | .... | 55.75 | 55.75 | 56.50 | 57.25 | 56.75 | 57.00 | 57.00 |
| **Lead (f. o. b. St. L.) c/lb. Duty 2¼ c/lb.** | 6.05 | 6.025 | 6.00 | 6.00 | 6.00 | .... | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| **Aluminum c/lb. Duty 5c/lb.** | 25 | 25 | 25 | 25 | 25 | .... | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| **Nickel c/lb. Duty 3c/lb.** | | | | | | | | | | | | | |
| Ingot | 35 | 35 | 35 | 35 | 35 | .... | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Shot | 36 | 36 | 36 | 36 | 36 | .... | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Electrolytic | 39 | 39 | 39 | 39 | 39 | .... | 39 | 39 | 39 | 39 | 39 | 39 | 39 |
| **Antimony (J & Ch) c/lb. Duty 2c/lb.** | 10.875 | 10.875 | 10.875 | 10.875 | 10.875 | .... | 10.75 | 10.50 | 10.375 | 10.75 | 10.50 | 10.625 | 10.75 |
| **Silver c/oz. Troy Duty Free** | 56.875 | 57.25 | 57.00 | 57.00 | 57.375 | .... | 57.125 | 57.25 | 57.50 | 57.75 | 57.75 | 57.75 | 57.50 |
| **Platinum $/oz. Troy Duty Free** | 66 | 66 | 66 | 66 | 66 | .... | 66 | 66 | 66 | 66 | 66 | 66 | 66 |

| *Holiday. | 18 | 21 | 22 | 23 | *24 | 25 | 28 | 29 | 30 | High | Low | Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Copper c/lb. Duty Free** | | | | | | | | | | | | |
| Lake (Delivered) | 13.75 | 13.75 | 13.75 | 13.75 | .... | 13.75 | 13.75 | 13.75 | 13.875 | 13.875 | 13.375 | 13.643 |
| Electrolytic (f. a. s. N. Y.) | 13.75 | 13.85 | 13.85 | 13.80 | .... | 13.80 | 13.85 | 13.85 | 13.90 | 13.90 | 13.45 | 13.663 |
| Casting (f. o. b. N. Y.) | 13.375 | 13.375 | 13.375 | 13.375 | .... | 13.375 | 13.375 | 13.375 | 13.50 | 13.50 | 12.85 | 13.244 |
| **Zinc (f. o. b. St. L.) c/lb. Duty 1¼ c/lb.** | | | | | | | | | | | | |
| Prime Western | 5.75 | 5.80 | 5.85 | 5.85 | .... | 5.85 | 5.90 | 5.90 | 5.90 | 5.90 | 5.60 | 5.756 |
| Brass Special | 5.80 | 5.85 | 6.00 | 6.00 | .... | 6.00 | 5.95 | 5.95 | 5.95 | 6.00 | 5.65 | 5.82 |
| **Tin (f. o. b. N. Y.) c/lb. Duty Free** | | | | | | | | | | | | |
| Straits | 58.00 | 58.50 | 58.375 | 58.25 | .... | 58.75 | 58.625 | 59.125 | 58.625 | 59.125 | 56.125 | 57.631 |
| Pig 99% | 57.50 | 58.00 | 57.875 | 57.75 | .... | 58.00 | 58.00 | 58.25 | 58.125 | 58.25 | 55.75 | 57.08 |
| **Lead (f. o. b. St. L.) c/lb. Duty 2¼ c/lb.** | 6.075 | 6.10 | 6.10 | 6.125 | .... | 6.125 | 6.15 | 6.20 | 6.30 | 6.30 | 6.00 | 6.063 |
| **Aluminum c/lb. Duty 5c/ lb.** | 25 | 25 | 25 | 25 | .... | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| **Nickel c/lb. Duty 3c/lb.** | | | | | | | | | | | | |
| Ingot | 35 | 35 | 35 | 35 | .... | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Shot | 36 | 36 | 36 | 36 | .... | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Electrolytic | 39 | 39 | 39 | 39 | .... | 39 | 39 | 39 | 39 | 39 | 39 | 39 |
| **Antimony (J & Ch) c/lb. Duty 2c/lb.** | 10.875 | 10.875 | 10.875 | 10.875 | .... | 10.875 | 10.875 | 10.875 | 10.875 | 10.875 | 10.375 | 10.781 |
| **Silver c/oz. Troy Duty Free** | 57.375 | 57.125 | 57.75 | 57.75 | .... | 58.125 | 57.875 | 57.875 | 58.125 | 58.125 | 56.875 | 57.506 |
| **Platinum $/oz. Troy Duty Free** | 66 | 66 | 66 | 66 | .... | 66 | 66 | 66 | 66 | 66 | 66 | 66 |

*Holiday.

# Metal Prices, December 5, 1927

## NEW METALS

Copper: Lake, 14.25. Electrolytic, 14.15. Casting, 13.75.
Zinc: Prime Western, 5.875. Brass Special, 5.925.
Tin: Straits, 59.375. Pig, 99%, 58.625.
Lead: 6.45. Aluminum, 25.00. Antimony, 11.625.
**Nickel:** Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. $128.00. Bismuth, $1.85 to $2.00.
Cadmium, 75. Cobalt, 97%, $2.60. Silver, oz., Troy, 58.375.
**Gold:** oz., Troy, $20.67. **Platinum,** oz., Troy, $66.00.

## INGOT METALS AND ALLOYS

| | |
|---|---|
| Brass Ingots, Yellow | 10 to11 |
| Brass Ingots, Red | 12¼to13 |
| Bronze Ingots | 12½to16 |
| Casting Aluminum Alloys | 21 to24 |
| Manganese Bronze Castings | 23 to40 |
| Manganese Bronze Ingots | 12½to16½ |
| Manganese Bronze Forging | 32 to40 |
| Manganese Copper, 30% | 25 to35 |
| Monel Metal Shot | 28 |
| Monel Metal Blocks | 32 |
| Parsons Manganese Bronze Ingots | 18¼to19¾ |
| Phosphor Bronze | 13½to15 |
| Phosphor Copper, guaranteed 15% | 18¼to21 |
| Phosphor Copper, guaranteed 10% | 16¾to20 |
| Phosphor Tin, guaranteed 5% | 75 to80 |
| Phosphor Tin, no guarantee | 65 to75 |
| Silicon Copper, 10%.....according to quantity..... | 28 to32 |

## OLD METALS

| Buying Prices | | Selling Prices |
|---|---|---|
| 11¾to12¼ | Heavy Cut Copper | 13¼to13¾ |
| 11¼to11¾ | Copper Wire | 12¾to13 |
| 9¾to10¼ | Light Copper | 11¼to11½ |
| 9½to10 | Heavy Machine Composition | 10½to10¾ |
| 7¾to 8 | Heavy Brass | 9 to 9¼ |
| 6½to 6¾ | Light Brass | 7¾to 8 |
| 7¾to 8 | No. 1 Yellow Brass Turnings | 9¼to 9¾ |
| 8¾to 9¼ | No. 1 Composition Turnings | 10¼to10¾ |
| 5¾to 6 | Heavy Lead | 6¾to 7 |
| 3¾to 4 | Zinc Scrap | 4¾to 5¼ |
| 9½to10½ | Scrap Aluminum Turnings | 12½to14½ |
| 14 to14½ | Scrap Aluminum, cast alloyed | 17½to18½ |
| 19½to20 | Scrap Aluminum, sheet (new) | 22 to22½ |
| 37½to39½ | No. 1 Pewter | 41½to43½ |
| 11½ | Old Nickel Anodes | 13½ |
| 17½ | Old Nickel | 19½ |

# Wrought Metals and Alloys

## COPPER SHEET

| | |
|---|---|
| Mill shipments (hot rolled) | 21¾c. to 22¾c. net base |
| From stock | 22¾c. to 23¾c. net base |

## BARE COPPER WIRE

15¾c. to 16c. net base, in carload lots.

## COPPER SEAMLESS TUBING

24½c. to 25½c. net base.

## SOLDERING COPPERS

| | |
|---|---|
| 300 lbs. and over in one order | 21¼c. net base |
| 100 lbs. to 200 lbs. in one order | 21¾c. net base |

## ZINC SHEET

| Duty sheet, 15% | Cents per lb. |
|---|---|
| Carload lots, standard sizes and gauges, at mill, less 8 per cent discount | 10.00 net base |
| Casks, jobbers' price | 10.50 net base |
| Open Casks, jobbers' price | 10.75 to 11.25 net base |

## ALUMINUM SHEET AND COIL

| | |
|---|---|
| Aluminum sheet, 18 ga., base price | 38 c. |
| Aluminum coils, 24 ga., base price | 32½c. |

## ROLLED NICKEL SHEET AND ROD

Net Base Prices

| | | | |
|---|---|---|---|
| Cold Drawn Rods | 53c. | Cold Rolled Sheet | 60c. |
| Hot Rolled Rods | 45c. | Full Finish Sheet | 52c. |

## BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

## SILVER SHEET

Rolled sterling silver 59c. to 61c. per ounce, Troy.

## BRASS MATERIAL—MILL SHIPMENTS

In effect December 2, 1927
To customers who buy 5,000 lbs. or more in one order.

| | Net base per lb. High Brass | Low Brass | Bronze |
|---|---|---|---|
| Sheet | $0.18¾ | $0.20¼ | $0.22¼ |
| Wire | .19¼ | .20¾ | .22¾ |
| Rod | .16½ | .21 | .23 |
| Brazed tubing | .26¾ | .... | .32 |
| Open seam tubing | .26¾ | .... | .32 |
| Angles and channels | .29¾ | .... | .35 |

For less than 5,000 lbs. add 1c. per lb. to above prices.

## BRASS SEAMLESS TUBING

23⅝c. to 24⅝c. net base.

## TOBIN BRONZE AND MUNTZ METAL

| | |
|---|---|
| Tobin Bronze Rod | 20¾c. net base |
| Muntz or Yellow Metal Sheathing (14"x48") | 18¾c. net base |
| Muntz or Yellow Rectangular sheet other Sheathing | 19¾c. net base |
| Muntz or Yellow Metal Rod | 16¾c. net base |

Above are for 100 lbs. or more in one order.

## NICKEL SILVER (NICKELENE)

Net Base Prices

| Grade "A" Sheet Metal | | | Wire and Rod | | |
|---|---|---|---|---|---|
| 10% | Quality | 26½c. | 10% | Quality | 29½c. |
| 15% | " | 28 c. | 15% | " | 33¼c. |
| 18% | " | 29¼c. | 18% | " | 36½c. |

## MONEL METAL SHEET AND ROD

| | |
|---|---|
| Hot Rolled Rods (base) 35 | Full Finished Sheets (base) 42 |
| Cold Drawn Rods (base) 43 | Cold Rolled Sheets (base) 50 |

## BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

# Supply Prices, December 5, 1927

## ANODES

| | | | |
|---|---|---|---|
| **Copper:** | Cast | 20¾c. | per lb. |
| | Rolled | 29⅛c. | per lb. |
| | Electrolytic | 18 c. | per lb. |
| **Brass:** | Cast | 19¾c. | per lb. |
| | Rolled | 19⅝c. | per lb. |
| **Zinc:** | Cast | 12½c. | per lb. |

| | | | |
|---|---|---|---|
| **Nickel:** | 90-92% | 45c. | per lb. |
| | 95-97% | 47c. | per lb. |
| | 99% | 49c. | per lb. |

**Silver:** Rolled silver anodes .999 fine are quoted from 61c to 63c. Troy ounce, depending upon quantity purchased.

## FELT POLISHING WHEELS WHITE SPANISH

| Diameter | Thickness | Under 100 lbs. | 100 to 200 lbs. | Over 200 lbs. |
|---|---|---|---|---|
| 10-12-14 & 16" | 1" to 3" | $3.00/lb. | $2.75/lb. | $2.65/lb. |
| 6-8 & over 16 | 1 to 3 | 3.10 | 2.85 | 2.75 |
| 6 to 24 | Under ½ | 4.25 | 4.00 | 3.90 |
| 6 to 24 | ½ to 1 | 4.00 | 3.75 | 3.65 |
| 6 to 24 | Over 3 | 3.40 | 3.15 | 3.05 |
| 4 up to 6 | ¼ to 3 | 4.85 | 4.85 | 4.85 |
| 4 up to 6 | Over 3 | 5.25 | 5.25 | 5.25 |
| Under 4 | ¼ to 3 | 5.45 | 5.45 | 5.45 |
| Under 4 | Over 3 | 5.85 | 5.85 | 5.85 |

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

## COTTON BUFFS

Full Disc Open buffs, per 100 sections.

| | |
|---|---|
| 12" 20 ply 64/68 Unbleached | $30.10–32.25 |
| 14" 20 ply 64/68 Unbleached | 40.10–41.65 |
| 12" 20 ply 80/92 Unbleached | 32.40–33.65 |
| 14" 20 ply 80/92 Unbleached | 43.70–44.80 |
| 12" 20 ply 84/92 Unbleached | 36.30–43.65 |
| 14" 20 ply 84/92 Unbleached | 48.60–59.20 |
| 12" 20 ply 80/84 Unbleached | 36.30–39.55 |
| 14" 20 ply 80/84 Unbleached | 48.60–53.60 |

Sewed Pieced Buffs, per lb., bleached 55-70c.

## CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

| | | |
|---|---|---|
| Acetone | lb. | .11–.16 |
| Acid—Boric (Boracic) Crystals | lb. | .12 |
| Chromic, 125 lb. drums | lb. | .25 |
| Hydrochloric (Muriatic) Tech., 20°, Carboys | lb. | .02 |
| Hydrochloric, C. P., 20 deg., carboys | lb. | .06 |
| Hydrofluoric, 30%, bbls | lb. | .08 |
| Nitric, 36 deg., carboys | lb. | .06 |
| Nitric, 42 deg., carboys | lb. | .07 |
| Sulphuric, 66 deg., carboys | lb. | .02 |
| Alcohol—Butyl | lb. | .19-23½ |
| Denatured, bbls. | gal. | .59 |
| Alum—Lump, Barrels | lb. | .03¼ |
| Powdered, Barrels | lb. | .042 |
| Aluminum sulphate, commercial tech | lb. | .02⅜ |
| Aluminum chloride solution in carboys | lb. | .06½ |
| Ammonium—Sulphate, tech. bbls | lb. | .03¾ |
| Sulphocyanide | lb. | .65 |
| Arsenic, white, kegs | lb. | .05 |
| Asphaltum | lb. | .35 |
| Benzol, pure | gal. | .60 |
| Borax Crystals (Sodium Biborate), bbls | lb. | .04½ |
| Calcium Carbonate (Precipitated Chalk) | lb. | .04 |
| Carbon Bisulphide, Drums | lb. | .06 |
| Chrome Green, bbls | lb. | .28 |
| Chromic Sulphate | lb. | .37 |
| Copper—Acetate (Verdegris) | lb. | .37 |
| Carbonate, bbls. | lb. | .16–.17 |
| Cyanide (100 lb. kegs) | lb. | .50 |
| Sulphate, bbls. | lb. | .05¾ |
| Cream of Tartar Crystals (Potassium bitartrate) | lb. | .27 |
| Crocus | lb. | .15 |
| Dextrin | lb. | .05–.08 |
| Emery Flour | lb. | .06 |
| Flint, powdered | ton | $30.00 |
| Flour-spar (Calcic flouride) | ton | $75.00 |
| Fusel Oil | gal. | $4.45 |
| Gold Chloride | oz. | $14.00 |
| Gum—Sandarac | lb. | .26 |
| Shellac | lb. | .59–.61 |
| Iron, Sulphate (Copperas), bbl | lb. | .01½ |
| Lead Acetate (Sugar of Lead) | lb. | .13¾ |
| Yellow Oxide (Litharge) | lb. | .12½ |
| Mercury Bichloride (Corrosive Sublimate) | lb. | $1.58 |
| Nickel—Carbonate dry, bbls | lb. | .29 |
| Chloride, bbls. | lb. | .17–.18 |
| Salts, single 300 lb. bbls | lb. | .10½ |
| Salts, double 425 lb. bbls | lb. | .10 |
| Paraffin | lb. | .05–.06 |
| Phosphorus—Duty free, according to quantity | | .35–.40 |
| Potash, Caustic Electrolytic 88-92% broken, drums | lb. | .09¾ |
| Potassium Bichromate, casks (crystals) | lb. | .08½ |
| Carbonate, 96-98% | lb. | .07½ |
| Cyanide, 165 lb. cases, 94-96% | lb. | .57½ |
| Pumice, ground, bbls. | lb. | .02½ |
| Quartz, powdered | ton | $30.00 |
| Rosin, bbls. | lb. | .04½ |
| Rouge, nickel, 100 lb. lots | lb. | .25 |
| Silver and Gold | lb. | .65 |
| Sal Ammoniac (Ammonium Chloride) in casks | lb. | .05½ |
| Silver Chloride, dry | oz. | .86 |
| Cyanide (fluctuating) | oz. | .60 |
| Nitrate, 100 ounce lots | oz. | .41½ |
| Soda Ash, 58%, bbls | lb | .02½ |
| Sodium—Cyanide, 96 to 98%, 100 lbs | lb. | .19 |
| Hyposulphite, kegs | lb. | .04 |
| Nitrate, tech., bbls. | lb. | .04¾ |
| Phosphate, tech., bbls | lb. | .03¾ |
| Silicate (Water Glass), bbls | lb. | .02 |
| Sulpho Cyanide | lb. | .45 |
| Sulphur (Brimstone), bbls | lb. | .02 |
| Tin Chloride, 100 lb. kegs | lb. | .42½ |
| Tripoli, Powdered | lb. | .03 |
| Wax—Bees, white ref. bleached | lb. | .60 |
| Yellow, No. 1 | lb. | .45 |
| Whiting, Bolted | lb. | 02½–.06 |
| Zinc, Carbonate, bbls | lb. | .11–.12 |
| Chloride, casks | lb. | .06¾ |
| Cyanide (100 lb. kegs) | lb. | .41 |
| Sulphate, bbls. | lb. | .03¾ |

# One More Month and Then—

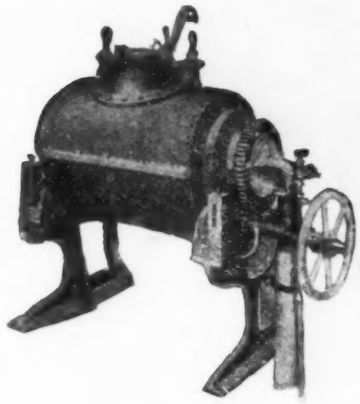
REVOLVING FURNACE
—MOTOR DRIVEN
For Melting Brass, Copper, Gold, Silver and Other Metals and Alloys.

TILTING CRUCIBLE FURNACE

STATIONARY CRUCIBLE FURNACE—Low Air, Combustion Chamber.

**—*a new year*. What will it bring you? Many foundries have added to their production and profit by using Monarch equipment. If you are not using Monarch Modern Melting Furnaces, Core Ovens, etc., by all means add them to your equipment in 1928. It will be a real investment—an investment that will pay you good, tangible profits for years to come.**

**There is a Monarch furnace for any foundry purpose—copper, bronze, aluminum, ferrosilicon, ferromanganese, cyanide precipitate, gold, silver, etc. Oil, Gas, Coal or Coke fuels.**

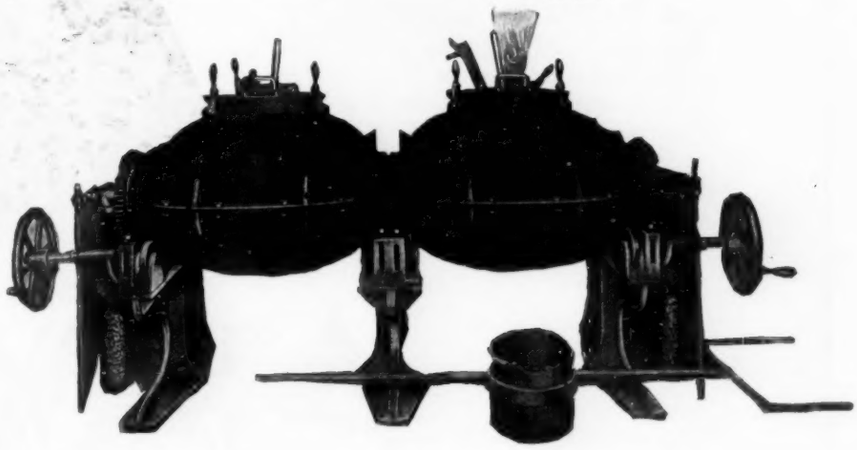


SIMPLEX FURNACE
FIG. No. 92
Capacities from 500 to 24,000 lbs. per heat. Ask for detailed catalog. Nos. 91 to 98—Air from 8 to 16 oz. from blower. References furnished.

**The "Monarch" line includes Monarch Modern Furnaces, Core Ovens, Ladle Heaters, Cupolettes, Dross Furnaces, Tilting Crucible or Revolving Non-Crucible Furnaces, etc.**

***Let's get together—now!***

**Write for catalog T.M.I. 12-1927.**



Double Chamber Melting Furnace, using chambers alternately. Exhaust heat of the first heats metal in second chamber almost to melting point at no extra expense. Each chamber can also be used independently.

**Manufactured by**

## The Monarch Engineering & Mfg. Co.

**1206 American Bldg.** **WORKS: Curtis Bay, Md.** **Baltimore, Md., U. S. A.**

# *Leave it to this Jury*

Foundryman, Foundry owner and metallurgist make up the jury that sits in judgment on the metal which goes into non-ferrous castings.

They know how often castings have to be scrapped because of defects caused by the use of un-uniform scrap metals or even because of the improper use or mixing of virgin metals.

They know that it is necessary to start right, in order to produce Perfect Castings. They know that for forty-seven years Ajax Process Ingots have been made not only to specified formula, but also to produce the best castings possible to that formula.

They know that Ajax Process Ingots give Perfect Castings not once in a while, but with a regularity that will lower foundry costs.

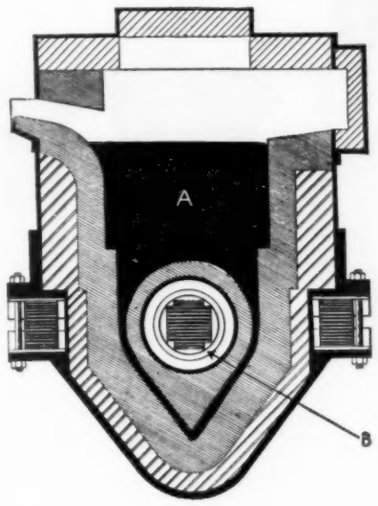
After a trial of Ajax Process Brass and Bronze Ingots let us hear *your* verdict on them.

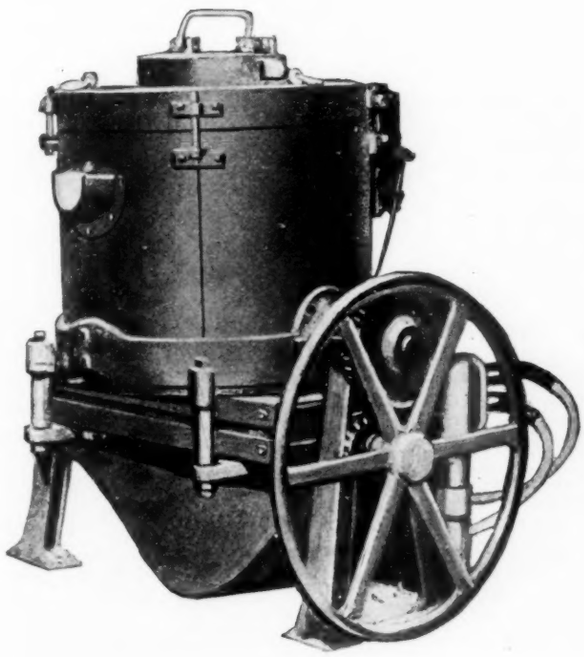
AJAX PROCESS STANDARD INGOTS

Ajax Plastic Bronze
Ajax Phosphor Bronze
Ajax Red Brass Ingots
Ajax Manganese Bronze
Ajax Anti-Acid Bronze
Ajax Hydraulic Bronze
Ajax Golden Glow Yellow Brass
Ajax Manganese Copper
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Phosphor Tin

AJAX PROCESS INGOTS

THE AJAX METAL COMPANY
*Established* 1880
PHILADELPHIA
NEW YORK · CHICAGO · BOSTON CLEVELAND



# *Foundry Methods do not stand still*

Foundry methods do not stand still in these days of keen competition. Your foundry *has* to keep abreast of the times otherwise business flows to your competitor.

The use of the Ajax-Wyatt Electric Furnace is one means of keeping your foundry up-to-date. These furnaces are now in constant use all over the world, melting more than 5,000,000 pounds of absolutely clean brass daily.

The outside surface of the Ajax-Wyatt Furnace remains cool throughout the entire melting period, thus insuring ideal working conditions. There are no fumes to give the dreaded "brass shakes," and no blinding heat.

The inside of the Ajax-Wyatt Furnace is ideally constructed to give the highest thermal and electrical efficiency.

The metal bath, A, is automatically churned around and around during the entire melting period, thus insuring purity of the metal and homogeneous alloying found in no other type of electric furnace. There are no moving parts to get out of order and maintenance cost is low.

All the advantages of the Ajax-Wyatt Electric Furnace are described in a catalog which is yours for the asking.

AJAX WYATT

ELECTRIC FURNACES

THE AJAX METAL COMPANY

*Established* 1880

PHILADELPHIA

NEW YORK · CHICAGO · BOSTON · CLEVELAND

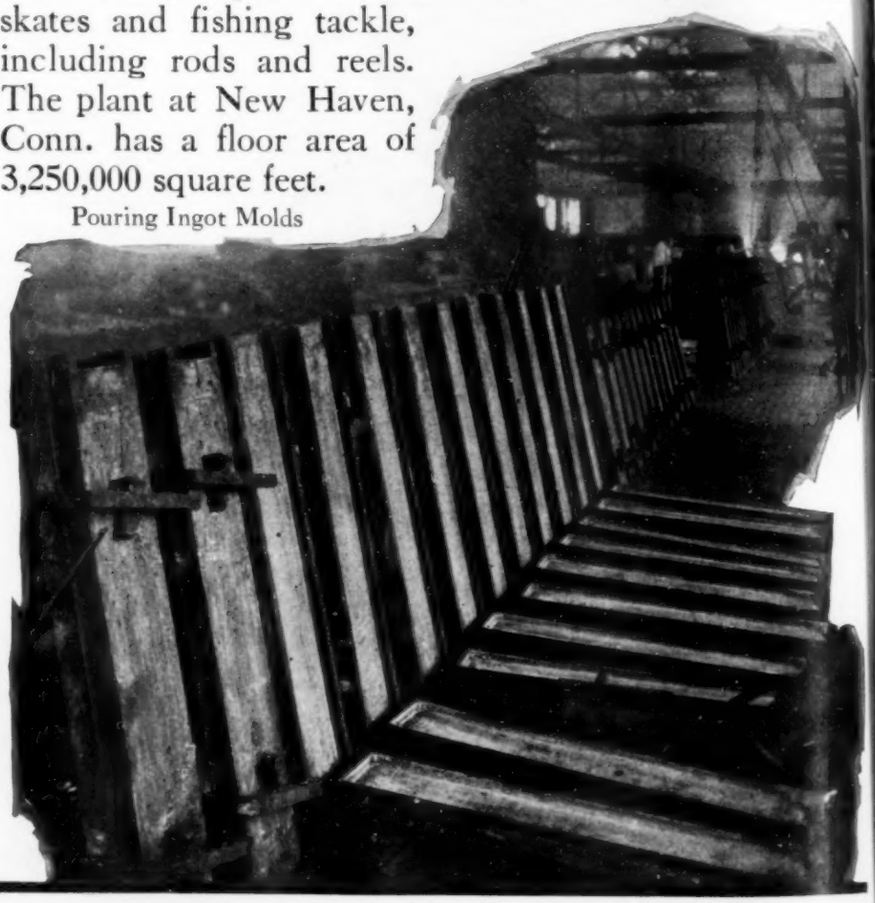
Plant of
The Winchester Repeating Arms Company,
New Haven,
Conn.

# Cruc

Some Winchester Products made from Graphite Crucible Melted Metal

THE Winchester Repeating Arms Co. is world-famed for rifles, shot guns, shot shells and metallic ammunition. The company was formed in 1866 with Oliver F. Winchester, one time Lieutenant Governor of Connecticut, as President. Today the company also manufactures flashlights and batteries, radio batteries, pocket cutlery, flat cutlery, scissors and shears, carpenter and mechanic's tools, ice and roller skates and fishing tackle, including rods and reels. The plant at New Haven, Conn. has a floor area of 3,250,000 square feet.

Pouring Ingot Molds



Winchester is especially known for the quality of its precision products and for the very rigid inspection system and standards which its products have to pass before they are placed on the market.

In the making of Winchester quality products, only quality materials are used and to produce its weekly requirement of one and one quarter million pounds of nonferrous metals, Winchester depends upon graphite crucible melting.

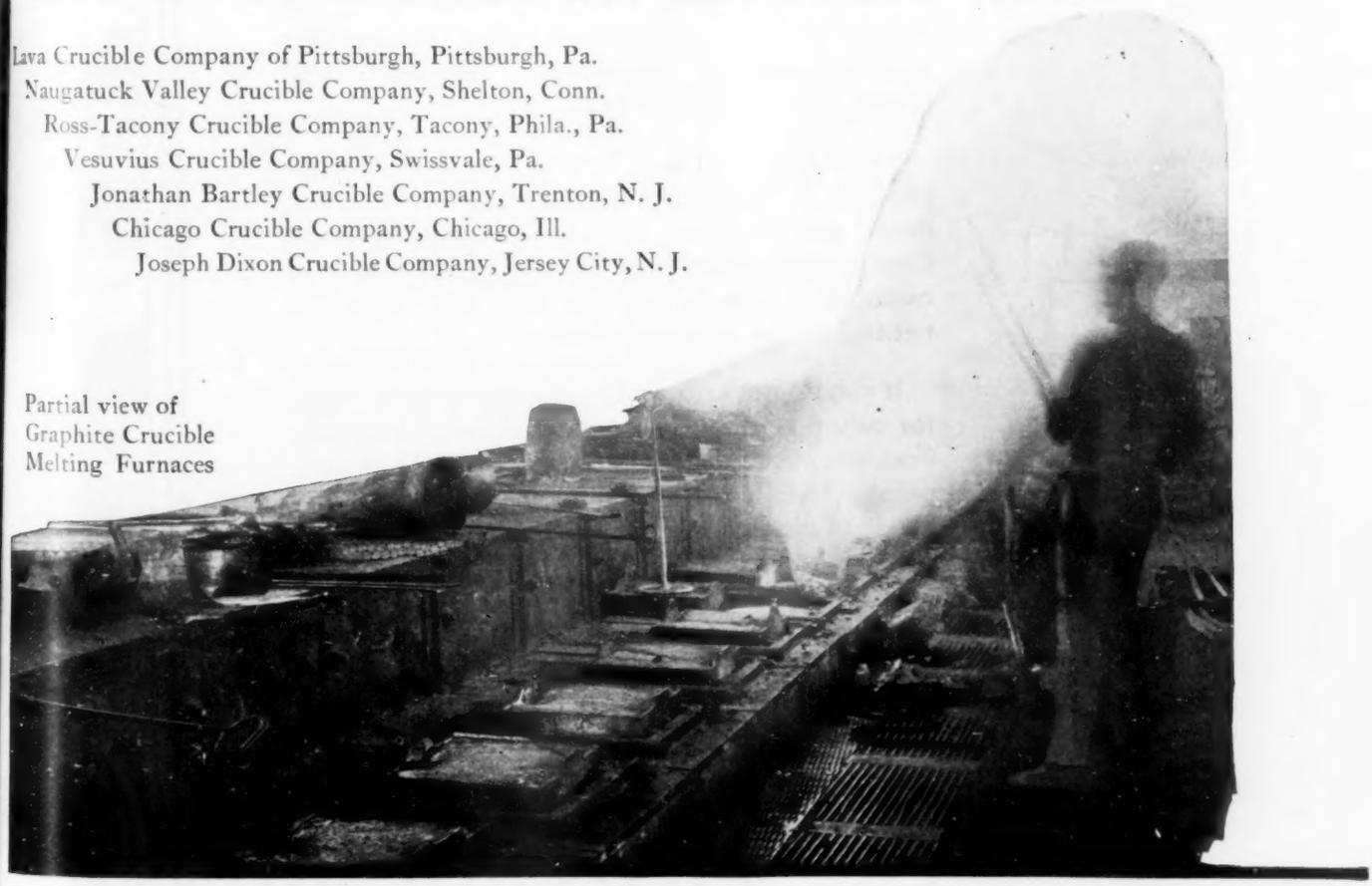
## AGE—ADAPTABILITY—

# cibles

TO produce the enormous tonnage of one and one quarter million pounds of nonferrous metals weekly on a 24-hour daily operation, The Winchester Repeating Arms Company uses 120 pit-type crucible furnaces and Number 70 graphite crucibles.

The diversity of products makes necessary metals of varying characteristics requiring numerous mixes. Graphite crucible melting assures quality metals, accuracy of control, low scrap loss, flexibility and ease of operation, combined with fuel economy, low melting and maintenance cost. Winchester is typical of many of the country's largest manufacturers who depend on graphite crucible melted metals.

Lava Crucible Company of Pittsburgh, Pittsburgh, Pa.
Naugatuck Valley Crucible Company, Shelton, Conn.
Ross-Tacony Crucible Company, Tacony, Phila., Pa.
Vesuvius Crucible Company, Swissvale, Pa.
Jonathan Bartley Crucible Company, Trenton, N. J.
Chicago Crucible Company, Chicago, Ill.
Joseph Dixon Crucible Company, Jersey City, N. J.



Partial view of Graphite Crucible Melting Furnaces

**RELIABILITY—ECONOMY**

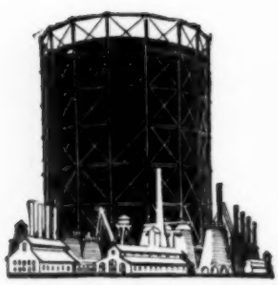
# THE *final score*~ RESULTS

AFTER all it is *efficiency* that wins the day, and forges ahead. Arguments and discussion are all right in their place, but the deciding factor is RESULTS.

Shakespeare says, "A good wine needs no bush"—meaning, of course, that its superior qualities advertise themselves. This is true also of gas, as an industrial fuel.

Gas furnaces installed in all manner of industries are the most potent arguments for installing more gas furnaces in similar manufactories. Competitors must keep abreast of the times in methods of production or they will soon fall behind in the matter of profits.

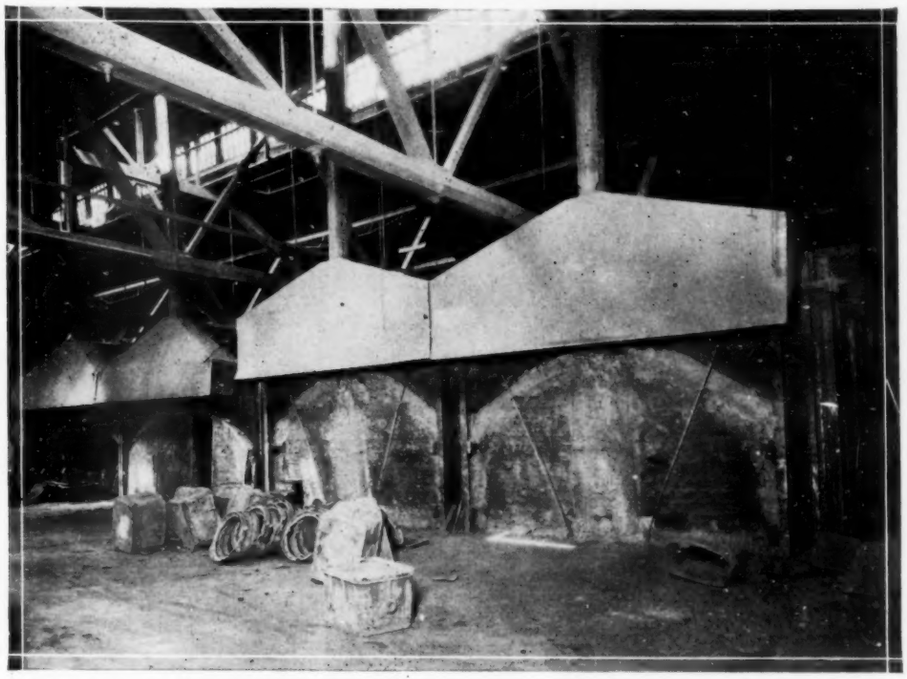
If you do not know what gas furnaces are doing for other companies, in your line of business, find out at once. Write and ask your gas company. Details are available on practically every kind of industrial pursuit practised in this country.



Gas is the preferred fuel for over 60,000 users.

American Gas Association
420 Lexington Avenue, New York City

**YOU CAN DO IT BETTER WITH GAS**



# Malleable Annealing Costs Reduced $1.53 per Ton

ANNEALING costs in the 90 pot double-compartment malleable furnace on the right, insulated with Nonpareil Brick in 1922, average $1.53 per ton of iron annealed less than in the similar uninsulated furnace on the left, operating under the same conditions.

This saving is itemized as follows:

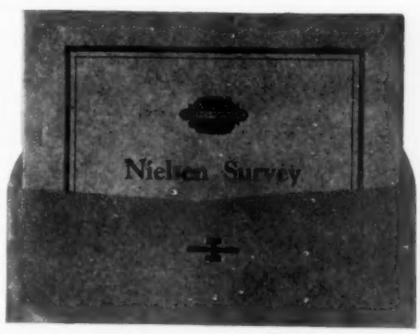
| | |
|---|---|
| $.261 | per ton iron in brickwork costs |
| .367 | per ton iron in fuel costs |
| .900 | per ton iron in annealing box costs |
| $1.528 | per ton, total |

A complete cost analysis was made on these two furnaces by the A. C. Nielsen Company in cooperation with the Eberhard Manufacturing Company, Cleveland, who operate them. A copy of this report, which has been approved by Mr. Walter G. Quayle, foundry superintendent, will be sent you promptly. Just return the coupon below.

ARMSTRONG CORK & INSULATION COMPANY
*Division of Armstrong Cork Company*
116 Twenty-fourth Street Pittsburgh, Pa.

*Complete Data Ready for You*

*If you are interested in knowing what it costs Eberhard to anneal castings, just return the coupon below. A copy of the complete report will be sent you promptly, without obligation.*




ARMSTRONG CORK & INSULATION COMPANY,
116 TWENTY-FOURTH STREET,
PITTSBURGH, PA.

Gentlemen:—Without obligating me in any way, you may send me a copy of the Engineering Report and the book, "Nonpareil Insulating Brick."

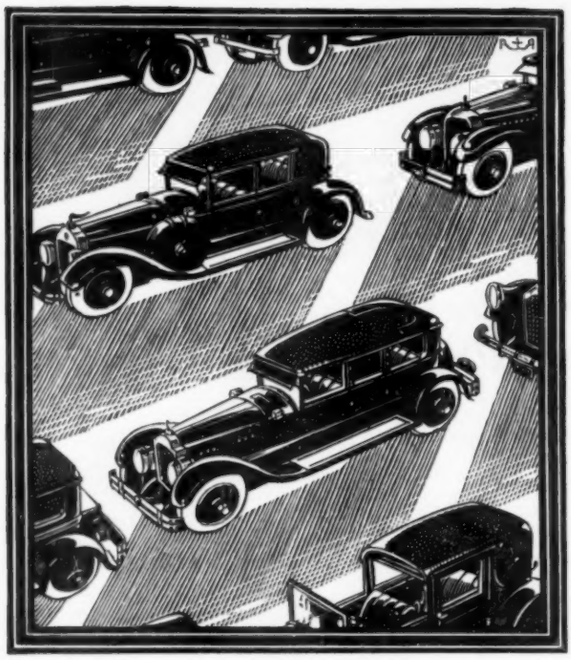
AC-916

Name .....
Address .....
City ..... State .....
.....

# Nonpareil Insulating Brick

***For Furnaces, Ovens, etc.***

# 9 Cars *in* 4 Cities *in* 1 Day



A NEW BRITAIN, Connecticut, car dealer is said to sell more automobiles per capita, of a certain high-priced make, than any other subdealer in the world. In clearing his floor of trade-ins, he uses Long Distance almost exclusively. Not long ago he made ten calls in one day to dealers in other cities. These calls sold two cars in Boston. Two in Worcester. Three in New York. Two in Philadelphia. Cash transactions, $17,000—telephone charges, $19.50!

"I CONSIDER THE TELEPHONE," says this automobile man, "the most valuable and most economical sales asset I have."

Almost any business house has many kinds of work that the long distance lines can do. Buying or selling in a distant city without leaving one's office. Making important appointments. Getting or giving rush information, specifications or prices. All business details can be discussed by telephone, just as in a personal interview. And with heavy savings in time and traveling expense.

What distant person or firm would it be an advantage to talk with, now? You'll be surprised how little it will cost. . . . . *Number, please?*

## BELL LONG DISTANCE SERVICE

# SC Gas-Fired Aluminum and Brass Furnaces

**S C Crucible Brass Furnace No. 1504**
*Supplied in two sizes for 180 and 240 lbs. of brass. Burner design and location prevent flame action on both crucible and furnace lining, with resulting increase in crucible life, and reduction in repair costs. Adaptable to copper, special alloys and other metals.*

**S C Aluminum Furnace No. 1711**
*One of a series of 4 standard furnaces with a capacity range from 300 to 675 lbs. of aluminum. Special composition cast iron pots have unusually long life. Can deliver a "heat" every 40 minutes after the first one.*

## *No Labor Wasted for Supervision, Yet Greater Production and Lower Fuel Costs*

THESE SC Gas-Fired Furnaces are controlled ***by a single valve.*** This valve, in turn, controls the Surface Combustion Inspirator-Burner, which ***automatically*** maintains perfect combustion, and the desired atmosphere, no matter what changes take place in air or gas lines. All the operator has to do is to hold a definite gauge reading for the manifold which feeds the mixed gas and air to the furnace, to get uniform heat input throughout the run.

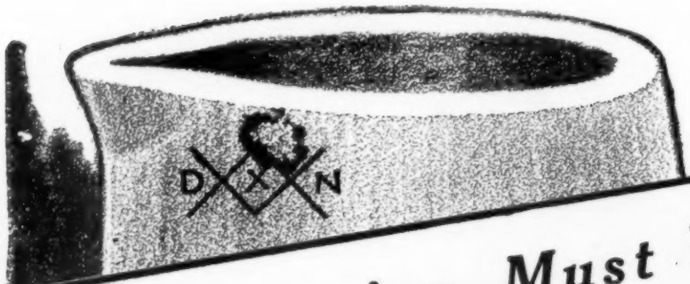
## *Why Your Plant Needs SC Furnaces*

Not only do they cut operating supervision to the limit, but they also eliminate the needless waste of fuel made necessary by constant adjustments of dual control valves. The rapid, uniform heating made available by the ***"Surface Combustion"*** principle guarantees quicker melting and greater production, at such low fuel costs that if you have gas in your plant you cannot melt as economically any other way. And the sturdy, well insulated construction of these furnaces cuts repair costs to the bone.

*It will pay you to talk to your local gas company about these furnaces! Many plants find it desirable to scrap their older furnaces and install SC equipment, because of the savings they make. Ask us for Bulletin H-12/13.*

**The Surface Combustion Co.**
**2375 DORR STREET, TOLEDO, OHIO**
***Branch Offices in All Principal Cities***
*Utilization Division of the Combustion Utilities Corporation*

**WHEREVER HEAT IS USED IN INDUSTRY**




## Your Choice Must Be "Dixon's"

In 1827, Joseph Dixon made the first successful Graphite Crucible. Since that time, the Joseph Dixon Crucible Company has maintained its position as the world's foremost producer of high grade crucibles.

Dixon builds into crucibles that quality which gives long life, economy, and durability beyond any reasonable expectation. If you base your judgement of crucible value on the cost per pound of metal melted, your choice must be "Dixon's".

If the safety of the men and freedom from breakage is the test, *your choice must be "Dixon's"*.

If the quality of the metal, its freedom from impurities, or the long service of the crucible are used as standards, YOUR CHOICE MUST BE "DIXON'S".

Send for the booklet "Crucibles, Their Care and Use". It will show you how to get more heats from any crucible.

**Joseph Dixon Crucible Co.**

Jersey City D X N New Jersey

1827 *One Hundredth Anniversary* 1927

## JOHNSON

## No. 305 Melting Furnace

This furnace has a capacity of 300 pounds. It is equipped with four large Johnson Burners, each with pilot light and shut-off valve. The lid is removable and the draw-off valve leads from the bottom of the pot. This special draw-off valve will not freeze and permits drawing off the metal as soon as it is melted. The No. 300 Melting Furnace is 31 inches high and weighs 185 pounds. Write for full details.

**JOHNSON GAS APPLIANCE CO.**
Cedar Rapids IOWA

## Pangborn Sand-Blasts
**and Dust Suppression Equipment**

## For Brass Foundries

Type "GF" Barrel

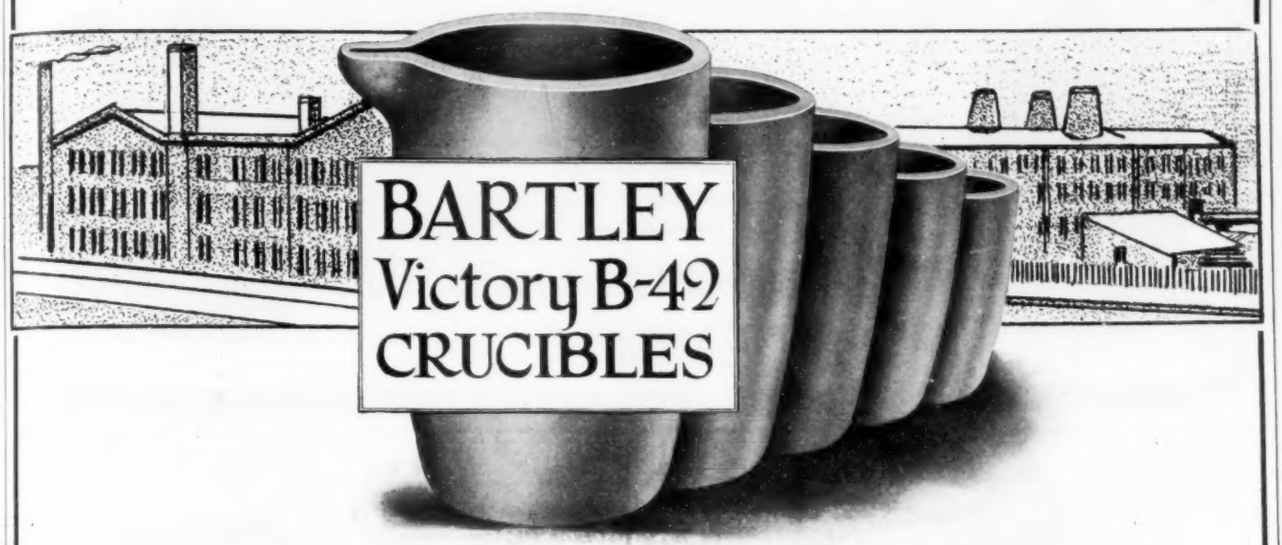
fit your space, your product, tonnage and your pocketbook. Whether you need a Cabinet, Table, Barrel, or Room.

One concern saved the price of Equipment in six months on a daily melt of 1,700 lbs.

Ask for a catalog, if only to file for use when you want it.

**Pangborn Corporation**
Sand-Blast and Dust Suppression Equipment, Hagerstown, Md.

**There is a Room, Table, Cabinet, or Barrel in the Pangborn line that just meets YOUR needs.**




# Preferred Stock

The finest stock of crucibles for varied uses is carried at our plant and preferred by modern foundrymen.

We also make crucibles for special melting.

We do not believe that one kind of crucible can be used to advantage for all kinds of metal melting and it is for this reason that we make a complete line. Every kind of crucible we make is by the

# LAWTON PROCESS

## JONATHAN BARTLEY CRUCIBLE CO., Trenton, N.J.

Francis Wagner
307 San Francisco St., El Paso, Tex.

E. D. Bullard Co.
565 Howard St., San Francisco, Cal.

A. C. Moulton
206 S. W. Temple, Salt Lake City, Utah

D. M. Hamilton
3201 Lawrence Ave., Detroit, Mich.

W. T. Withers Supply Co.
Martin Bldg., Birmingham, Ala.

BEST materials. Careful manufacture. Unexcelled facilities. Years of experience. The quality of our crucibles insures satisfaction. Your next order requested.

*Write for Booklet*

**McCullough-Dalzell Crucible Co.**

**PITTSBURGH, PA.**

**M & P**

**BLAST GATES**

In Several Sizes for Many Purposes

*Send for Bulletins and Price List*

**MINER & PECK DEPARTMENT**

FARREL-BIRMINGHAM COMPANY, INC.

DERBY, CONN.

**IF YOU HAVE DIFFICULT SOLDERING**
**"IT CAN BE DONE"**
**with**

*END YOUR SOLDERING TROUBLES*

*SAMPLE FREE*

**can be used on all metals and their alloys** Except Aluminum

JOHNSON MFG. CO., 729 Washington Blvd., Chicago, Ill.

**Dipping and Plating Baskets**

Made of

Iron, Steel, Galvanized, Brass, Copper, Aluminum, and Monel

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**THE JOHN P. SMITH CO.**

493-501 State St., New Haven, Conn.

**DIE-CASTING MACHINES**

Zinc, Tin—Lead Alloys

For—SLUSH and SOLD CASTINGS

**R. E. BYRD** **318 C-REED STREET, ERIE, PA.**

**PHOSPHORUS**

For Phosphor-Bronze Copper, Tin, Etc.

**GENERAL CHEMICAL COMPANY**

Packard Bldg., 15th and Chestnut Sts., Philadelphia, Pa.

**ROCKWELL FURNACES**

**ELECTRIC and FUEL**

W. S. ROCKWELL COMPANY NEW YORK CLEVELAND DETROIT CHICAGO

USE ONLY THE CHAS. K. SCHWEIZER CO.

**MOULDS**

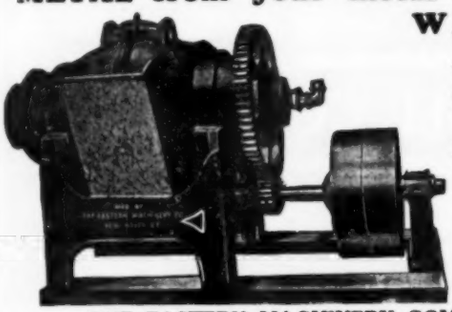
**Waterback and Plain**

207 Vine Street, ST. LOUIS MO.

SOLDER, BABBITT, LINOTYPE, TIN AND LEAD MOULDS.

Send your inquiries on special designs.

**Our machine will reclaim all the METAL from your metal foundry WASTES**



These machines are in world-wide use.

Reclaims metal down to

**½ of 1%**

*Write for Particulars*

**THE EASTERN MACHINERY COMPANY**

37 Gregory Street New Haven, Conn.

*SAVE YOUR BRASS WASTE AND SAVE MONEY*

**J. P. FANNING CO.**

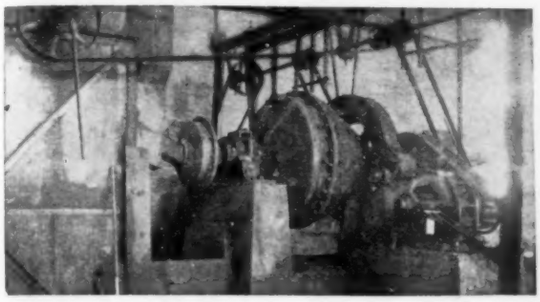
Makers of SOFT METAL MOULDS for casting lead, solder, babbitt metal, buck shot, car seals, etc.

19-21 Marion St., Brooklyn, N. Y. Phone Haddingway 2919 W. J. Whitley, Mgr.

**Crucibles**

ROSS-TACONY CRUCIBLE CO. TACONY PHILADELPHIA, PA.

Established 1871



**Foundry Waste Recovered**

*At Small Cost*

Metal waste ground in the Hardinge Conical Mill will produce a maximum recovery in one operation, under a low maintenance cost. The Conical Mill discharges the material without over-grinding, making the product available for re-melting without further treatment.

Write for Catalogue No. 8.

**HARDINGE COMPANY**
YORK, PENNSYLVANIA
WORKS AND MAIN OFFICE YORK, PENNA.
BRANCH OFFICES
NEW YORK, N. Y., 120 BROADWAY
SALT LAKE CITY UTAH: CONTINENTAL BANK BLDG.
CABLE ADDRESS "HARDINGE, NEW YORK"

a few Lava Crucibles, folks. Their service is all thu evidence needed tu convince thu most skepticle that Lava's are wot thu boss says they are—*unusually durible an' economikal.*

Depend on Lavas tu reduce your meltin' costs—they'll never disserpoint you!

LAVA LUKE

LAVA CRUCIBLES
Lava Crucible Co. of Pittsburgh
Dept. F
Pittsburgh

Sales Representatives: THE S. OBERMAYER CO., Chicago (Warehouse), Newark, Cincinnati, Milwaukee, St. Louis; CANADIAN FOUNDRY SUPPLIES & EQUIPMENT, LIMITED, MONTREAL (Warehouse), Toronto (Warehouse); SNYDER FOUNDRY SUPPLY CO., Los Angeles, Cal.

Also Manufacturers of the Super-Refractory Cement—"Lavapatch," and Lining material—"Lavaram."

**Make Your Own SPECIAL SHAPES and TILE**

MIXTURE 100 lbs. Hytempite to 175 lbs. Refractory Material

Use Ganisand or crushed old firebrick that will pass ¼" mesh (including fines) mixed with

**HYTEMPITE**

*Full directions in new Folder G.M.-116*

**QUIGLEY FURNACE SPECIALTIES CO., Inc.**
26 Cortlandt St. New York

*Stock and Service in Every Industrial Center*

**For Quicker Cleaning**

From Finest Satin Finish to Deep Frost

Use

**NEW HAVEN SANDBLAST**

Cabinets and Barrels
Automatic and Self Contained

**New Haven Sandblast Company**
New Haven, Conn.

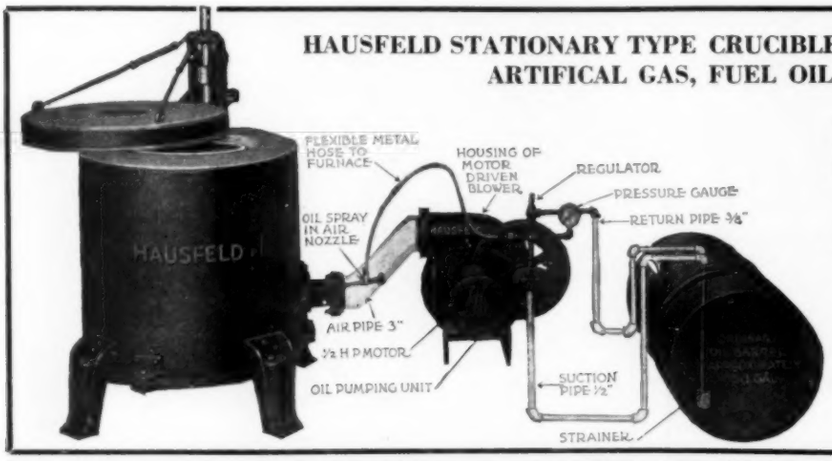
SINGLE SPINDLE

**Cock Grinder**

adapted for all classes of ground key work up to 2" and for use in the small shop making one to two hundred cocks a day. Also useful and economical in the big shop for grinding small lots of special cocks.

*MADE FOR MOTOR AND BELT DRIVE*

**TURNER FOUNDRY & MACHINE CO.**
917-25 W. Schiller Street, Philadelphia, Pa.




**HAUSFELD STATIONARY TYPE CRUCIBLE FURNACE FOR NATURAL OR ARTIFICAL GAS, FUEL OIL OR KEROSENE**

**Built to Suit Standard Crucibles No. 35 up to No. 100.**

*Full Information and Catalog Upon Request*

**The Campbell-Hausfeld Co.**
HARRISON, OHIO

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# Insure Your Castings with Boronic Alloys

Boronic Alloys have now been used for years—Continuous use by the same foundries.

Their use make Clean Dense Castings a certainty.

We will furnish the proof if you furnish the opportunity.

FOR ALLOYING, DEOXIDIZING AND SOLID-CASTING ALL METALS — ALL METAL BORONIC PRODUCTS IN SHOT FORM — MADE IN AMERICA FOR ALL THE WORLD

**THERE IS A SPECIAL BORONIC ALLOY FOR EVERY PURPOSE**

**American Boron Products Company, Inc.**
Ramsdell and Elmwood Avenues
BUFFALO, NEW YORK

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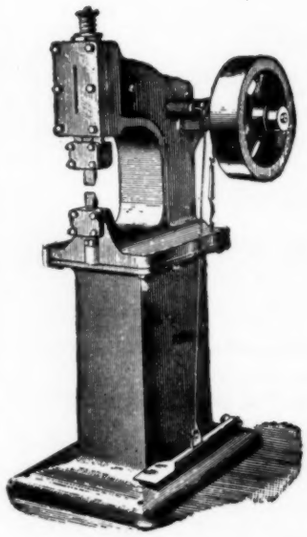

# Shuster Sprue Cutters

make good clean cuts

are substantial Machines

pay for themselves in a short time

***May we tell you more about them?***

**THE F. B. SHUSTER COMPANY**
**NEW HAVEN, CONN.**

*Also makers of Automatic Wire Straightening and Cutting Machinery*

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# KLINGENBERG CLAY

**City of Klingenberg**

Sole Producer for Graphite Crucibles, High Temperature Cements, Zinc Muffles and Retorts, Etc., Etc.

**Exclusive Sales Agents for U. S. A. and Canada**

**ADOLPHE HURST & CO., INC.**
**Graybar Bldg. (420 Lexington Ave.)**
**New York**

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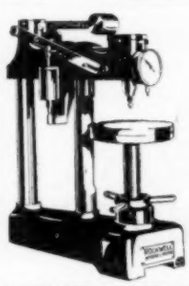


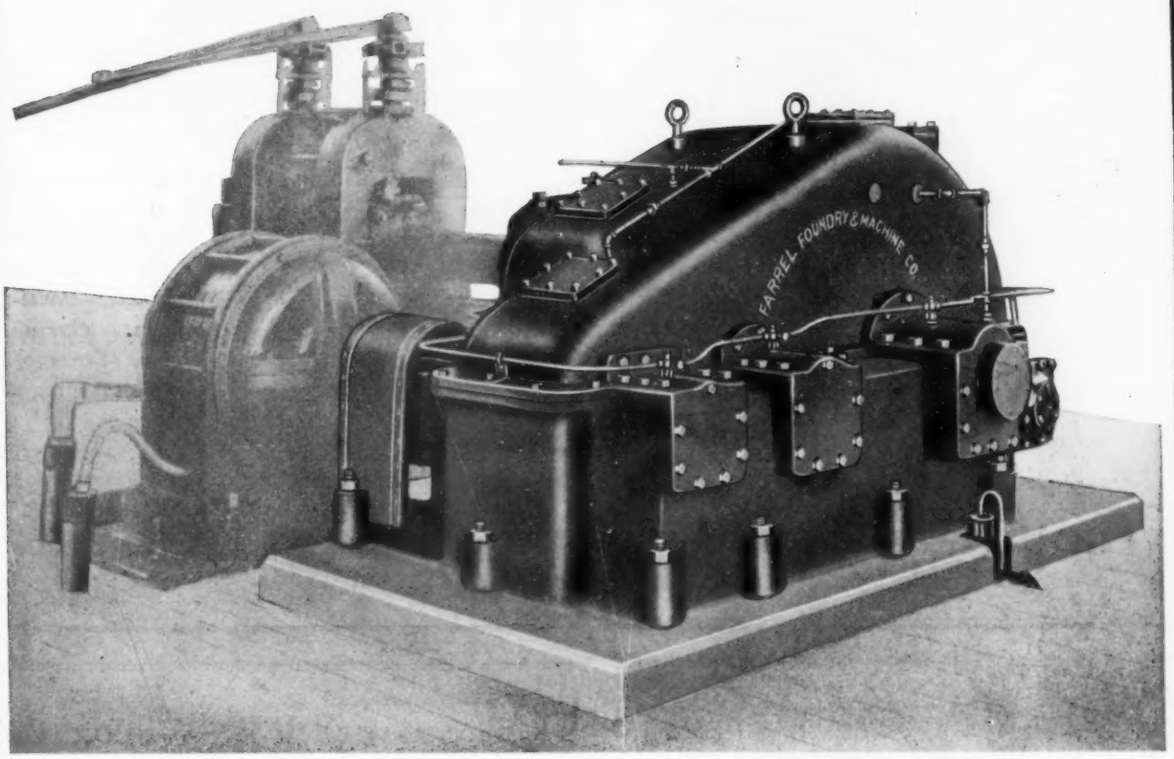
*for measuring* **TEMPER** *and* **TEMPERATURE**

**PYROMETERS**
Indicating
Recording
Controlling

**ROCKWELL HARDNESS TESTER**
for Brass, Bronze, Steel, etc.

**WILSON-MAEULEN COMPANY INC**
**731 EAST 143rd STREET, NEW YORK**

FARREL
REG. U.S. PAT. OFF.




## ROLLING MILL DRIVE

Highly efficient Double Reduction Rolling Mill Drive with the latest type features, including Farrel-Sykes continuous tooth generated cut Double Helical Gears, all enclosed in oil tight housing. In same housing are included the rolling mill pinions. All pinions hardened. All gears and bearings automatically lubricated by forced feed and splash system.

This drive will show a material saving in power and upkeep.

Can be furnished in any size required.

## FARREL-BIRMINGHAM COMPANY INC.
## ANSONIA, CONN.

*Successors to*

Farrel Foundry & Machine Co., Ansonia, Conn. and Birmingham Iron Foundry Derby, Conn.

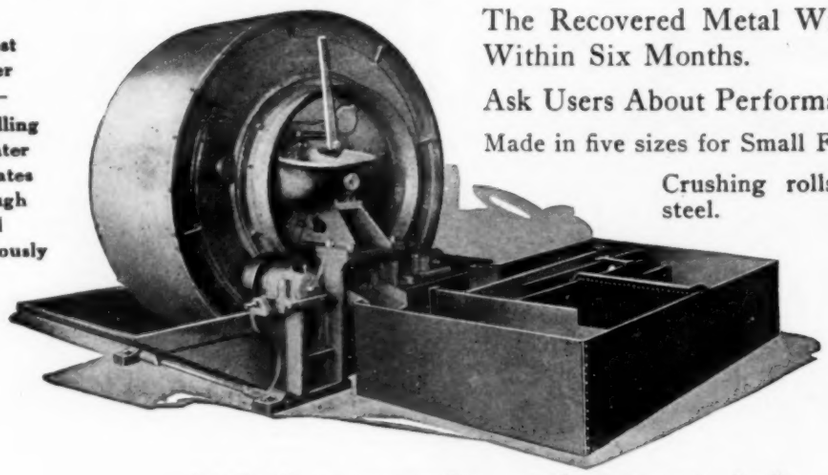
Branch Plant, Buffalo, N. Y.

Reclaim All Metal From Your Foundry and Casting Shop
Cinders—Ashes—Skimmings and Old Crucibles with the

# Standard Metal Reclaiming Mill

**Lowest Power**

**One Filling of Water Circulates Through Mill Continuously**



The Recovered Metal Will Pay for Mill Within Six Months.

Ask Users About Performance and Results.

Made in five sizes for Small Foundry to Smelter.

Crushing rolls 12% manganese steel.

***The Present Mill Is the Result of Improved Development During Twelve Years of Continuous Service.***

*"Ask about our twelve months payment plan"*

## The Standard Equipment Co., Inc.
**New Haven, Conn.**

DO YOU KNOW the Meaning of SLOW SPEED LOW POWER **DUST COLLECTING ?**

It means economy, less fuss and muss—greater purification of air—greater efficiency.

*Send for data*

## The Allington & Curtis Mfg. Co.

HIGH PRESSURE PNEUMATIC CONVEYORS.

WOOD WASTE STOKERS. DUST COLLECTING SYSTEMS.

*Branch Office and Works:* Boston, Mass.

Saginaw Michigan

*Offices:* Chicago, Ill. New York, N. Y.



## The Babcock & Wilcox Co.

**85 LIBERTY STREET, NEW YORK**

**ESTABLISHED 1868**

**Water Tube Boilers**
**Steam Superheaters**
**Chain Grate Stokers**

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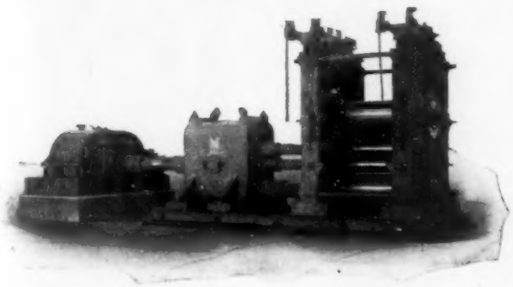
PHILADELPHIA, Packard Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
DETROIT, Ford Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
PHOENIX, ARIZ., Heard Building
NEW ORLEANS, 344 Camp Street
HOUSTON, TEXAS, Electric Building
DALLAS, TEXAS, Magnolia Building
DENVER, 444 Seventeenth Street
SALT LAKE CITY, Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, Central Building
PORTLAND, OREGON, Gasco Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building
HONOLULU, H. T., Castle & Cooke Building



# 4-HIGH MILLS

**for Continuous Rolling of Ferrous and Non-ferrous Sheets and Strips**

**MACKINTOSH-HEMPHILL COMPANY**

Established 1803 at Pittsburgh, Pa., U.S.A.

**PIONEERS—ENGINEERS—BUILDERS of**

*"The Best in Rolling Mill Machinery"*

Pitts. Iron & Steel Fdry. — Fort Pitt Works
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**Machinery for the Manufacture of Strips, Sheets, Tubes, Rods, Wire and Cable.**

*Designers and Builders of*

SPECIAL MACHINERY

*Builders of*

BLAKE & JOHNSON
COLD ROLLING MACHINERY

**The Torrington Mfg. Co.**

TORRINGTON, CONN., U. S. A.

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# *Platers' Chemicals*

COOPER'S CERTIFIED CHEMICALS

## *Carbonate of Copper*

50% Metallic Copper yields the maximum plate per pound and more plate per hour.

## *Chloride of Nickel*

In Nickel Plating Cast Zinc

## *Chromic Acid*

For *new* method of plating.
Will not tarnish
Will not corrode
Requires no polishing

**Chas. Cooper & Co.**

196 Worth St. — New York City

**Works: Newark, N. J.** — **Manufacturers Since 1857**

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# Metal Spinning Lathes

**Tools, Chucks and Accessories for Round and Oval Work**

**22" Oval Spinning Lathe with Compound Slide Rest**

**SEND FOR PRICE LIST**

Sizes of the Regular Machines run from 15" to 26" Swing and the Extension or Gap Type Lathes will be furnished in 22" x 44" Swing Size, and 27" x 60" Swing Size.

**P. PRYIBIL MACHINE CO., Inc.**

**Established 1859**

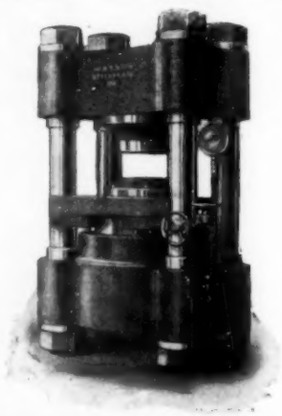
**512 West 41st Street** — **New York**

# HYDRAULIC PRESSES

FOR

**DIE SINKING, PRESSING, EMBOSSING, SHEET METAL FORMING, DRAWING, CUPPING, FLANGING, BENDING AND EXTRUDING**

Our line of presses contains many machines built for the working of metals. We build everything necessary to equip complete hydraulic plants—pipe, valves, pumps, accumulators, packing, etc.



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THE WATSON-STILLMAN COMPANY

W-S HYDRAULIC

**14 Carlisle St., New York**

Chicago Cleveland Detroit Richmond Philadelphia St. Louis

359 W-S HYDRAULIC

# Aero Brand

AEROIDS
Sodium Cyanide 96/98%
(½ ounce ball form)

COPPER CYANIDE
70/70½%

ZINC CYANIDE
55½%

SILVER CYANIDE
80½%

AMERICAN CYANAMID PRODUCTS — AERO BRAND

AMERICAN CYANAMID COMPANY
535 Fifth Avenue New York, N. Y.

*Distributors*

Apothecaries Hall Co., Waterbury, Conn.
Thos. Buchanan Co., Cincinnati, Ohio
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Grasselli Chemical Co., Cleveland, Ohio
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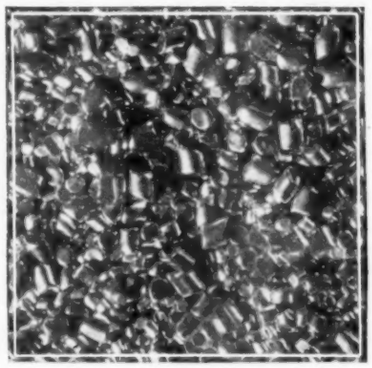
Frederic B. Stevens Co., Detroit, Mich.
Kleinsteuber-McNutt & Allison, Buffalo, N. Y.
Thompson-Hayward Chemical Co., St. Louis and Kansas City, Mo.



## BEAVER "DIAGONALS"

Trade Mark Registered, United States Patent Office March 22nd, 1927. Serial No. 225575.

Polishing Steels consisting of diagonal cut units, glass hard crocus finished and combining in one piece the best features of round balls, taper pins, blunt nosed cones and discs. Effective on every class of work that can be barrel burnished and destined to eventually replace ordinary round balls.

***Write for Your Samples To-Day***

## H. LEROY BEAVER

**Liberty Trust Bldg. PHILADELPHIA, PA.**

*The Entire Beaver Line of Metallic Burnishing Materials Is Manufactured in Philadelphia*

## "JIM DANDY" BUFFS save you money

*Buy Your Loose and Sewed Buffs direct from Manufacturers*

**THE ODEN CORPORATION**

College Point, L. I., New York City

COMPOSITIONS BUFFS PLATERS' SUPPLIES

## Why Not??? NATROLIN "T"

Use Just One Cleaner for All Your Metal Cleaning

Fills the bill satisfactorily. Sold on approval, of course!

And for your oxidizing . . .

**McKEON'S "LIQUID SULPHUR"**

(The Oxidizing Agent of Today)

Your orders will be appreciated.

WILFRED S. McKEON, Pres. Greensburg, Penna.

## NICKEL PLATING

**NICKEL · COPPER · BRASS**

**Hot and Cold Galvanizing**
**BRIGHT DIPPING AND OXIDIZING**

*We Solicit Your Inquiries on the Above Finishes*

**CONTRACT PLATING CO.**
**36 RIVER STREET BRIDGEPORT, CONN.**

# VIENNA LIME

Verkaufsstelle der Wiener Putzkalk-Werke, Pegnitz-Bavaria

*Offered by*

HENRY RINGHOF

**303 Pearl St., New York Phone: Beekman 1855**

# COMPLETE CHEMICAL CONTROL
## *OF NICKEL-PLATING SOLUTIONS*

THE NICKELOMETER
*MEASURES ACIDITY, NICKEL AND CHLORIDES*
THREE INSTRUMENTS IN ONE—PRICE, $30.00

70 College Street **THE STIRLEN COMPANY** New Haven, Conn.

# CHROMIUM

Electro-plating machinery and especially machines and processes for the deposition of Chromium must be judged by *Performance*. Our machines and apparatus and processes are in successful use in many parts of the United States. Research work and extensive experimentation for years have been carried on by us and our experience and accumulated knowledge are available to the industry.

***Correspondence is invited from interested parties***

**The Chromium Machine Company, Inc.**
**Sag Harbor, Long Island, N. Y.**

# LEA GREASELESS COMPOUND

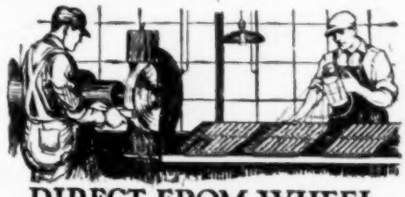
**For Producing**

## Brush Brass and Satin Finishes

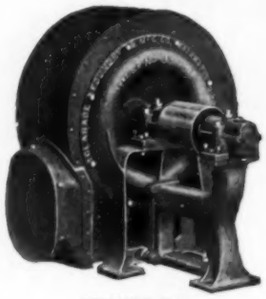
Eliminates the final washing and drying operations.

Manufactured by
THE LEA MFG. CO.
987 Watertown Ave.
Waterbury, Conn.

Western Distributors
GEO. A. STUTZ MFG. CO.
1645 Carroll Ave.
Chicago, Ill.



**DIRECT FROM WHEEL TO LACQUER**



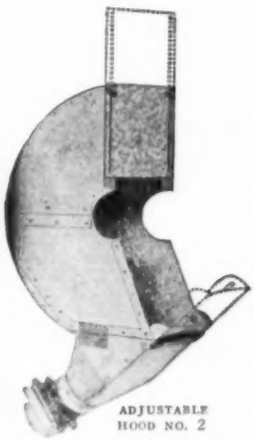
EXHAUST FAN

# We Are Not Lawyers

# But

Our dust collecting systems conform to the most rigid **State Laws** and are designed to operate efficiently.

IMPROVED STANDARD HOOD



ADJUSTABLE HOOD NO. 2

**The Cleveland Blow Pipe & Manufacturing Co.**

*Dust Collecting and Ventilating Engineers*

**6950 Kinsman Rd., Cleveland, O.**

Please send me a copy of "Dust Collecting Efficiency."

Name .....

Company .....

Address .....

Open View

IMPROVED VACUUM HOOD

Magnus CLEANERS

## New Compound Discovered for Removing Tripoli

**NOW AVAILABLE TO ENTIRE TRADE**

***It's called Magnus Tripoli Solvent***

THE formula was developed for one of the world's largest metal manufacturers to take the place of a whale-oil soap, which gave a bad odor and took a long time to do a good job. It is odorless and cleans fast. It is used in place of whale-oil, soap chips or Plater's Compound. The upkeep is very low; it is easy to handle; it reduces sawdust rubbing and hand wiping to a minimum, in some cases eliminating them entirely. There is no tarnish or spotting. This new product has been satisfactorily tested on a cost basis against cleaners selling as low as 7 cents, and has given exceptional results in several nationally known plants over a period of 11 months.

The above are strong statements but we offer the proof—in MAGNUS TRIPOLI SOLVENT. Ask our Representative or write us for a sample to make a test.

**Magnus Chemical Company**

Manufacturers of Cleaning Materials

718 Atlantic Avenue · · · Brooklyn, N.Y.

GRASSELLI CHEMICALS AND EXPLOSIVES INVESTMENTS

# CADALYTE

A
Process and Product
for

## CADMIUM PLATING

Cadmium Anodes
Cyanide of Soda
Caustic Soda
Platers Chemicals

The Grasselli Chemical Co.

Established 1839

Sales Offices

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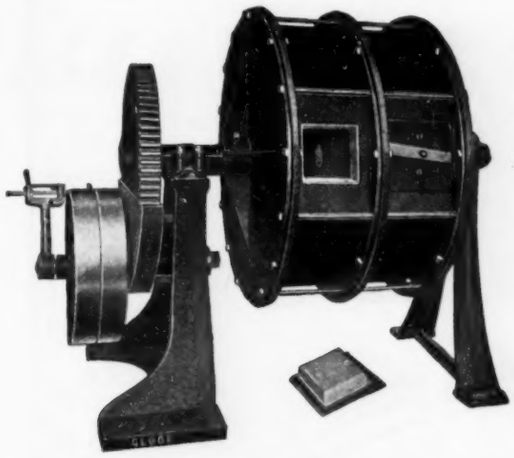
GRASSELLI GRADE

Standard of Metal Purity for 87 Years

# GLOBE TUMBLING BARRELS



THE GLOBE MACHINE & STAMPING CO.

1260 W. 76th St. Cleveland, Ohio

## *Faster and Cheaper!*

GLOBE TUMBLING BARRELS remove burrs, fins and flash from metal parts much faster and at lower costs.

The work is done automatically, except for the loading and unloading of the shell. Hundreds and thousands of pieces are smoothed at a time with a marked saving in manufacturing costs.

The Globe Tumbling Book tells how. Send for it.

LIONITE — KING OF ABRASIVES — NIAGARA FALLS, N.Y. — GENERAL ABRASIVE CO.

Trade Mark

Our Booklet on MODERN POLISHING will interest you

Your Polishing Department Needs

# LIONITE

THE ELECTRIC ABRASIVE

***A large Manufacturer of Brass Tubing writes:***

"Lionite is fine. We have ordered additional quantities from your agents."

*(Name given on application.)*

GENERAL ABRASIVE CO. Niagara Falls, N. Y.

## Electroplating Generators
## Motor Generators

50 up to 10,000 amperes

*Sturdy—Efficient—Dependable*

Up-to-date apparatus in every detail; leaders in this line. Write for Bulletin.

**Chas. J. Bogue Electric Co.**

132-138 King Street, New York

## Chemical Lead Burning

***Lead Chemical Equipment***

**LEAD LINED TANKS**

Lead Linings for Tanks, Vats, etc.; Lead Coils; Lead Sleeves; Agitators; Lead, Acid Jugs and Carboys; Acid Waste Line; Lead and Lead Lined Pipe and Fittings; Special Lead Traps and Drain Boxes; Pure Tin Linings for Vessels of Every Character

CHEMICAL LEAD WORK OF EVERY DESCRIPTION

JOHN F. ABERNETHY & CO., INC.

708-710 Myrtle Ave., Established 1901 BROOKLYN, N. Y.

*DURIRON* is an iron-silicon cast alloy, solidly resistant to the attack of most acids and alkalies, hot or cold, dilute or concentrated. Its hard surfaces are not scored by abrasives carried in solution.

# Checkmates Corrosion

In pickling, plating and bright dipping processes, where corrosion and erosion eventually destroy handling equipment, Duriron acid-resisting apparatus is not at all affected.

Because of its complete immunity from the action of corrosives, Duriron will not contaminate the solutions it handles.

Mechanically and chemically fit to do the job—Duriron equipment saves time and money, and is potential means of bettering the product.

*Duriron is produced only by*

The DURIRON COMPANY DAYTON·OHIO

*PUMPS*, piping, valves, tank outlets and special equipment for use in the Metal Industry are manufactured from Duriron. An engineering organization experienced in fighting corrosion is maintained to help solve *your* problem.



## EVIDENCE OF BLOWER EFFICIENCY

## Saving $16,500 a Year in Cleaning Labor

F. O. Peterson, Plant Engineer, The Jeffrey Mfg. Co., Columbus, Ohio, says: "For over 10 years we have been satisfied users of Kirk & Blum blower systems in our foundry, woodworking shops and heat-treating rooms.

"In 2 of these departments, 9 cleaners and a total cleaning expense of $16,500 a year are being saved as compared with the cost of hand-cleaning.

"In our heat-treating plant, the removal of burnt gases was a serious problem until our Kirk & Blum system was installed. The gases are heavy, and the existing stacks would not exhaust them.

"Kirk & Blum systems move more air with less power cost, because elbows, fittings and other parts are specially designed to prevent back-pressure or clogging."

**Write for complete series of plant reports on blower operation.**

THE KIRK & BLUM MANUFACTURING CO.

Manufacturers of Blower Systems, Industrial Ovens and Sheet Metal Products

2859 Spring Grove Ave. Cincinnati, Ohio

Detroit Office: 3-129 Gen'l Motors Bldg.

KIRK & BLUM Blower Systems

Collecting-Conveying-Ventilating

The recent B & K book "Blower Systems" describes approved design and application of dust collecting equipment in wood-working and metal-working plants, glass, chemical, and other industries. Send the coupon for your copy

The Kirk & Blum Mfg. Co., Cincinnati, Ohio. M.I.

Send your book "Blower Systems" and series of reports by plant executives on blower operation in their factories.

Firm .....

Individual Name .....

Title .....

Address .....

TRADE
PIONEER
MARK

# NOTE:

Many of the largest and most discriminating manufacturers in this country and Canada have adopted

## "ZIP" CROCUS

For Producing

**(The Finish Beautiful)**

on

## CHROMIUM PLATE

There must be something to it!

TRADE
PIONEER
MARK

**Zucker Sons' Co., Inc.**

228 Broadway Elizabeth, N. J.

# ACE HARD RUBBER

An ACE patented hard rubber lined steel tank for hydrochloric acid storage - 3200 gal. capacity

IN PROCESS and PLATING SERVICE the ACE patented method of hard rubber lining for steel tanks may be safely used for high temperature work, with minimum current and without danger of short circuits.

Tanks are generally lined inside with a few inches down outside, but for extreme work they may be covered as well as lined. Any size or shape tank; open or closed types.

For processing ACE hard rubber lined tanks are impervious to the action of hydrofluoric acid (concentrated); acetic acid; citric acid (any strength); sulphuric acid, 50° Baumé; hydrochloric acid (concentrated); nitric acid, 16° Baumé.

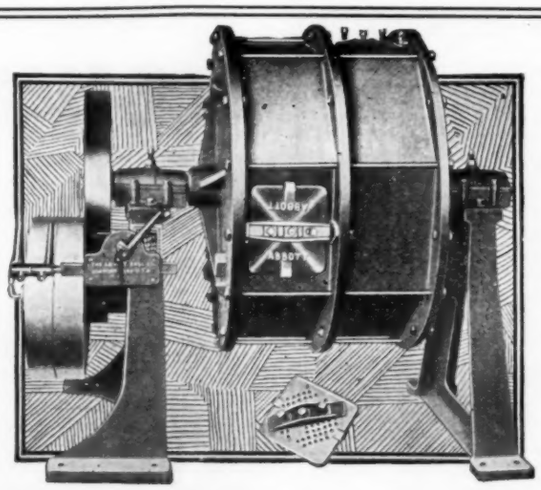
For plating and pickling industries, ACE hard rubber lined tanks are impervious to pickling solutions, nickel, copper, chromic acid, zinc, tin, silver, gold, and caustic solutions.

We also successfully cover Pipe, any size from 1" up, Utensils, Fittings, Plating Racks, Tumbling Barrel Sides, etc.

*Consult our Engineers*

*(Information gladly given. No obligation.)*

**AMERICAN HARD RUBBER CO.**
11 MERCER STREET
NEW YORK, N.Y.
Largest Exclusive Manufacturers of Hard Rubber and its Products



# "Rubbing Under Pressure—"

—the principle of hand buffing applied to ball burnishing. This is The Abbott Way. ¶ The results combine thoroughness with machine efficiency. Of course costs are lowered; but at the same time an excellent finish is produced. ¶ We can show you how to halve your finishing costs.

*Send us samples for a burnishing estimate*

## The Abbott Ball Company

*"Originators of Commercial Ball Burnishing"*

1046 New Britain Ave., HARTFORD, CONN.

# *Announcing*

The Purchase of the

## CHROMILITE PROCESS CORPORATION

1033 South High Street, Akron, Ohio

by the

## NEW HAVEN SHERARDIZING COMPANY

Hartford, Conn. and Akron, Ohio

This combination is in line with New Haven Sherardizing's progressiveness in its continued progress as one of the United States largest jobbers in rust proofing metals by Chrome plating, Udylite plating, and Sherardizing with complete plants in Hartford, Conn., and Akron, Ohio, to handle job plating and as manufacturers of plating equipment and plant installation for the general trade.

*Send your Requests to*

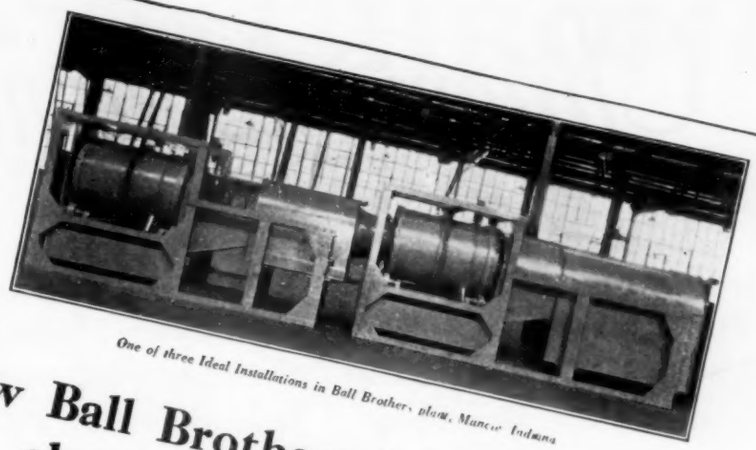
## NEW HAVEN SHERARDIZING COMPANY

or

## CHROMILITE PROCESS CORPORATION

| *Main Office:* | *Branch Plants:* | *Representative:* |
|---|---|---|
| 868 Windsor St., Hartford, Conn. | 1033 South High St., Akron, O.<br>911 Sweitzer Ave., Akron, O. | METALS PROCESSES, INC., 155 Chambers St., New York City, N. Y. |

*This advertisement appeared in the October Issue of "Metal Industry"*



One of three Ideal Installations in Ball Brothers plant, Muncie, Indiana

# How Ball Brothers in Muncie clean a million zinc parts a day

IDEAL
TRADE MARK REG. U.S. PAT. OFF.

**Engineering Service**

Problems of removing scale, chips and fins from castings and forgings—of scrubbing, rinsing and drying stamped and drawn parts, removing grease, oil and chemicals—are special problems. Ideal Engineering Service involves a study of your particular problem and the application of automatic equipment to solve it, at a considerable saving in labor. Our engineers will gladly examine your situation — asking them to do so will incur no obligation.

In their big plant in Muncie, Ind., Ball Brothers had the problem of cleaning, rinsing and drying a tremendous daily output of drawn zinc containers.

Ideal engineers surveyed the problem and applied to its solution a special assembly of standard Ideal units designed to clean the parts effectively.

Three installations like the one shown have been made. The zinc shells, covered with the drawing compound, are fed into the first washing drum and there subjected to the action of hot washing compound circulated by a pump.

The worm in the drum carries the shells forward to the intermediate screen where the solution is drained off and the parts pass through a hot water spray. Automatically they travel into the large rinsing drum, are rinsed with clear hot water, pump-forced, then into the long hooded drying screen which is heated by hot blast and are discharged onto a conveyor, completely cleaned and dried.

IDEAL
INDUSTRIAL MACHINERY
TRADE MARK IDEAL REG. U.S. PAT. OFF.
Division of
Consolidated Concrete Machinery Corpn., Winton Pl.

**...and now they've ordered a *fourth!***

Ideal Metal Cleaning Equipment *must* save the buyer money. Repeat orders are placed on *performance*, not promises. How soon will you let Ideal engineers examine *your* metal cleaning probem?

# IDEAL
## INDUSTRIAL MACHINERY

TRADE MARK IDEAL REG. U.S. PAT. OFF.

WINTON PLACE : CINCINNATI, OHIO

Division of Consolidated Concrete Machinery Corporation

# Chromium Plating

A new basic industry, the art of Chromium Plating, has been established. While methods for the electro deposition of chromium have been known for some time, a successful and strict control of the process is a recent development by United Chromium, Incorporated.

Chromium, one of the hardest known metals, is deposited as a plating on products of iron, steel, copper and brass, with either a beautifully brilliant, or a dull satin-like finish, which will not tarnish. It is rust and acid resistant, of great hardness, reduces friction and increases the life of the product many-fold.

Just as the electrical industry has been developed through the organized and well financed efforts of internationally recognized institutions, so is Chromium Plating now to receive the benefits of concentrated resources.

So far reaching is the influence of Chromium Plating that the countless thousands of products of the metal industries may now have a new brilliant beauty of finish and longer life in combination with great resistance to heat, acids, rust and corrosion.

A group of representative industrialists and engineers have pledged, through the formation of United Chromium, Incorporated, a well-defined program to further develop the science of the electro deposition of Chromium.

The benefits of this organization may be obtained through the operating units equipped to render a co-operative engineering service and to issue licenses, under United Chromium, Incorporated patents, to the manufacturers who desire a successful process of Chromium Plating for their own plants.

**UNITED CHROMIUM**
INCORPORATED

# UNITED CHROMIUM
INCORPORATED

*Created for the purpose of rendering to the chromium plating industry the benefit of organized research and development.....*

UC INC.

*The Exclusive Licensing Agents*

**GENERAL CHROMIUM CORPORATION**
3220 BELLEVUE AVE
DETROIT

**CHROMIUM CORPORATION OF AMERICA**
120 BROADWAY
NEW YORK

# PEERLESS COMPOSITIONS

SAVE DOLLARS

## OLD BUT TRUE

## The Proof of the Pudding Is in the Eating—

You make the test at our expense. Tell us your work speed of lathe and we will send the samples.

**TRIPOLI**
**GREASE STICK**
**CROCUS**
**EMERY COMPOUND**
**WHITE STAR COLORING**

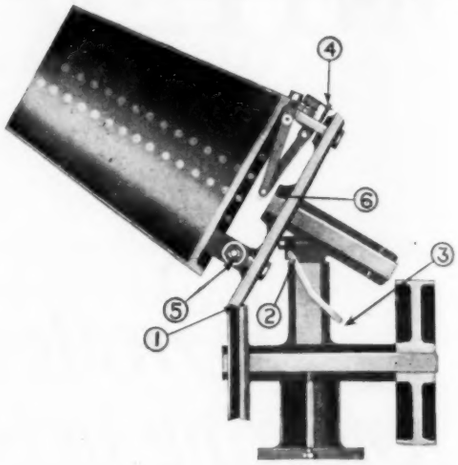
**RADIANT WHITE FINISH**

LEA GREASELESS COMPOUND FOR PRODUCING BRUSH BRASS, SATIN OR COLONIAL FINISHES.

## GEO. A. STUTZ MFG. CO.

1643-47 Carroll Ave. Chicago, Ill.

## BENCH TUMBLING BARREL




Cut shows another of the HENDERSON Better Tumbling Barrels. This unit can be used for small lots, experimenting and a multitude of other uses. Write us for more data.

THE HENDERSON BROS. CO.
*The Tumbling Barrel People*
135 So. Leonard St. Waterbury, Conn.

A quarter of a century's growth has strengthened the reliability of

## IMPROVED KEYSTONE ABRASIVES

**Imported and Domestic Qualities**

Unexcelled for grinding and polishing metal and other surfaces.

An expert research service is at the disposal of those wishing to find new and better ways of preparing surfaces for buffing, plating, etc.

May we assist you in improving the quality and reducing the cost of your work?

WRITE TO:

## KEYSTONE EMERY MILLS
**4322 Orchard St., Philadelphia, Pa.**

Factories
Philadelphia, Pa. Lockport, N. Y.

# *Ask BAIRD About Tumbling Barrels*

***for clean, smooth surfaces on small castings***

BAIRD Tumbling Barrels give clean, smooth, rubbed surfaces to small parts. The rotating, sliding action eliminates the usual preliminary operations necessary to plating and polishing. This together with the fact that several barrels can be run by one operator, makes the BAIRD Tumbler an economical machine.

***Write Today for Illustrated Catalog***

## THE BAIRD MACHINE COMPANY

BRIDGEPORT, CONN.

Geo. H. Alexander, Mchy., Ltd., Birmingham, England, for automatic machinery.
Geo. Cruickshank, Ltd., Birmingham, England, for tumbling barrels.
Fenwick Freres, Paris, France, with branch offices in Belgium, Switzerland, Italy, Spain, Portugal and Rio de Janeiro, Brazil.

In addition to making **all types** of tumbling outfits, The Baird Machine Company is the world's leading designer and builder of Automatic Machines to produce articles from wire and ribbon metal.

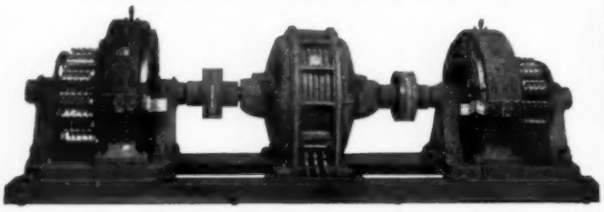
TRADE
MATCHLESS
MARK

The Same HIGH STANDARDS of MATCHLESS QUALITY
maintained in producing our regular line of Composition are just as thoroughly embodied in the manufacture of

MATCHLESS CHROMIUM COMPOSITION

THE MATCHLESS METAL POLISH CO.
840 W. 49th Place, CHICAGO, ILL. 726 Bloomfield Ave., GLEN RIDGE, N. J.

J & L GENERATORS



J. & L. Direct Current, Motor Generator for Electrolytic Work, Electroplating, and General Deposition of Metals. Built in Sizes from 200 to 10,000 Amperes.

*Maintaining*

CONSTANT VOLTAGE with all changes of load in amperes. VOLTAGE is adjustable from 2 to 8 volts; in the larger sizes from 2 to 12 volts. At whatever point the voltage is set for, to the full range of the generator, this voltage will remain constant for all changes of load in amperes to the full capacity of the generator.

OUR SERVICE DIVISION
is at your service and prepared at all times to give you assistance with your plating problems, with technical and practical experience to scientifically determine your requirements.

THE JANTZ & LEIST ELECTRIC CO.
Western Avenue and York St. Cincinnati, Ohio

TOLHURST
CENTRIFUGAL
METAL DRYER
Dries small metal parts in 2 to 5 minutes without the nuisance of sawdust and at a lower cost!

TOLHURST MACHINE WORKS
TROY, N. Y.
New York Office - - - - - - - - - - 183 Madison Avenue

Borolon
TRADE MARK

POLISHING GRAIN

Borolon Polishing Grain (Electric Corundum) is the product of our own electric furnaces. As Manufacturers we control uniformity of grain which assures satisfaction to the user. All regular grain numbers supplied in eight different sized containers. Write for samples and prices of the numbers you regularly use.

ABRASIVE COMPANY
Main Office and Factory
BRIDESBURG
PHILADELPHIA, PA.
ABRASIVE REGISTERED
Factory Branch
586 W. Washington Blvd.
CHICAGO, ILL.
District Office: 149-65 Larned Street, East, DETROIT, MICHIGAN

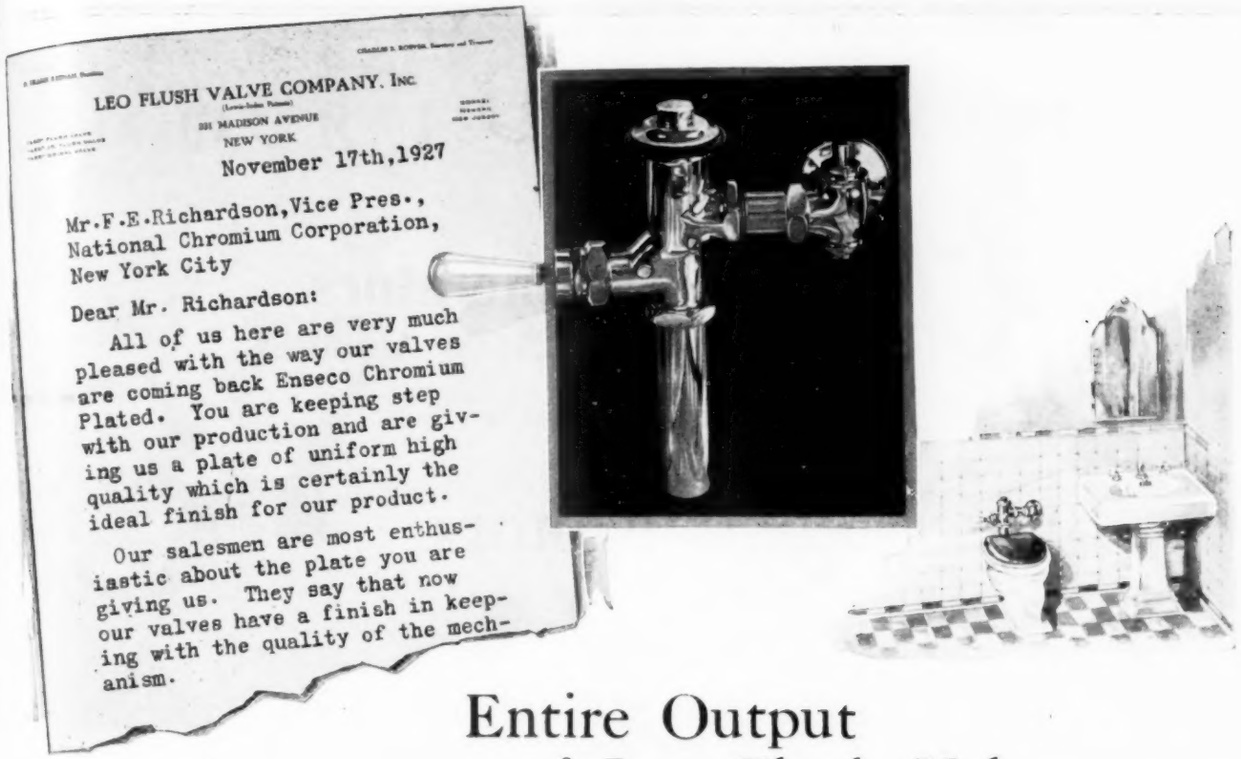
There's never an "off season" on Quality Products

Tripolex
Hi-po-lime
Tallo-stick
Emerite
Triple-E
Stick Rouge

*Buffs and Polishing Wheels too, are better if marked*

E. Reeg Burns

Manufacturing Corporation
BROOKLYN, N. Y.
CLEVELAND, O. CHICAGO, ILL.



LEO FLUSH VALVE COMPANY, INC.
(Lever-Jenkins Patents)
501 MADISON AVENUE
NEW YORK

November 17th,1927

Mr.F.E.Richardson,Vice Pres.,
National Chromium Corporation,
New York City

Dear Mr. Richardson:

All of us here are very much pleased with the way our valves are coming back Enseco Chromium Plated. You are keeping step with our production and are giving us a plate of uniform high quality which is certainly the ideal finish for our product.

Our salesmen are most enthusiastic about the plate you are giving us. They say that now our valves have a finish in keeping with the quality of the mechanism.

# Entire Output of Leo Flush Valves Enseco Chromium Plated

*Chromium Engineers at your Service*

You will benefit by the extensive knowledge and experience of National Chromium Engineers. They will adapt this new wonder plate to your products just as they have with those of other manufacturers.

No polishing will ever be needed on the Leo Flush Valves now being made. A wet cloth removes all soil and restores them to their original brightness. The entire output of the Leo Flush Valve Company is being Enseco Chromium Plated with the satisfaction expressed in the letter above.

Every day, Chromium Plate is being used to add new sales punch to a product or to increase the efficiency of machinery. Every industry can use this new plating to advantage. Why wait for your competitor to show you the way or force you to adopt Chromium Plate? You can adapt Chromium Plate yourself by using the Chromium Engineering Service we have ready to serve you.

After we have proved the value of Enseco Chromium Plate on your product to your absolute satisfaction, we will install your own plating equipment or will do your plating for you in our modern Chromium Plating plant. Our own plant is proof that we understand what special facilities turn out the highest grade of Chromium Plate at minimum cost.

Investigate Enseco Chromium Plate! It will mean a great deal to your business. Write or phone for more information.

**NATIONAL CHROMIUM CORPORATION**

Phones: Walker 9296-7

200 Varick St. New York City

*The Wonder Surface*

**Superlative wearing qualities because hardest metal known, resists high temperatures and practically all corrosive agents and has extremely low co-efficient of friction.**

**Platinum-like beauty is non-tarnishing, stays bright without polishing.**

# ENSECO Chromium Plate

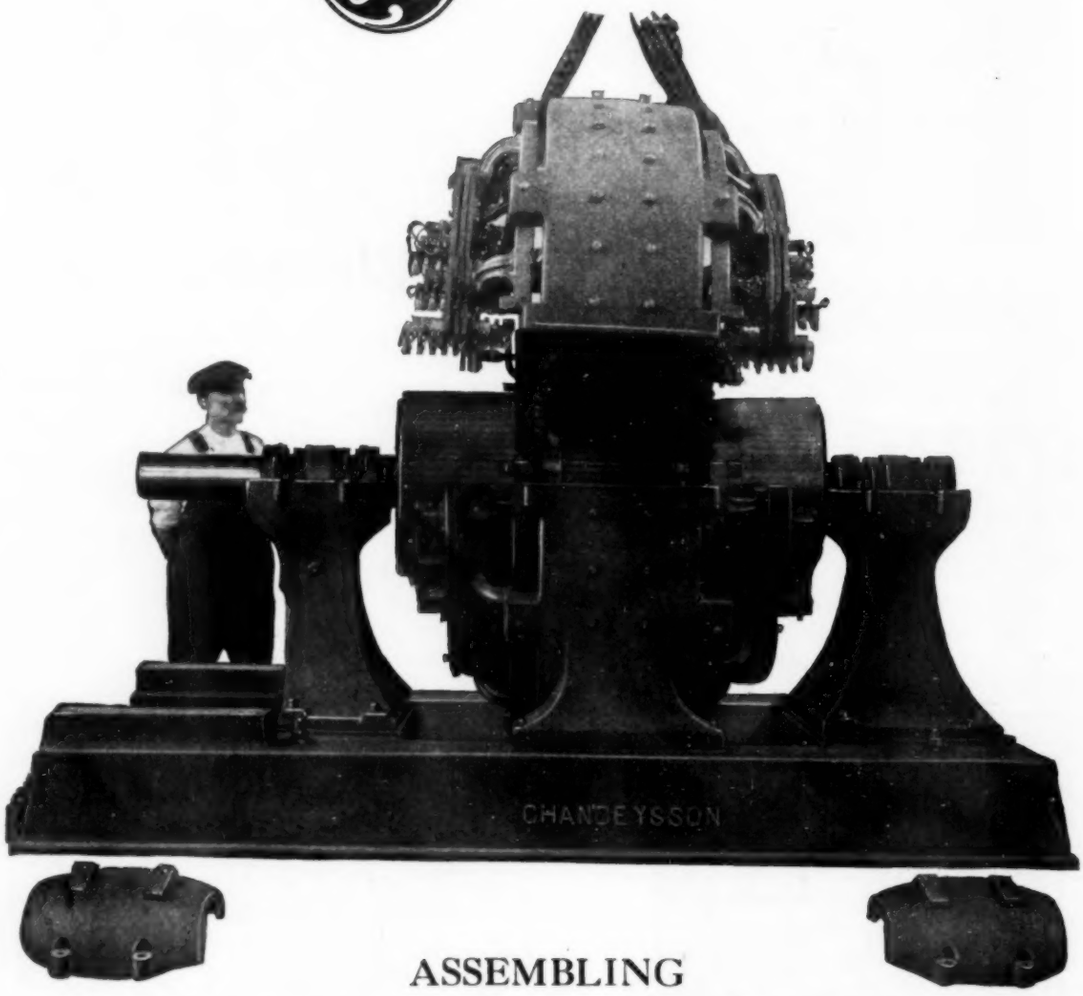
Chandeysson

**Generators**

**25 to 25,000 Amperes**

Direct Connected to

GE **Motors**




ASSEMBLING

**10,000 AMPERE 12-VOLT GENERATOR**

(Shaft and base extension for installation of Synchronous motor)

Chandeysson Electric Co., St. Louis, U.S.A.

# OUR 1928 PROGRAM

# 37

Chandeysson

**Generators**

**25 to 25,000 Amperes**

Direct Connected to

GE **Motors**

will be

CARRIED IN STOCK

**to assure our customers prompt service**

**Ready for IMMEDIATE SHIPMENT from St. Louis**

Automatic Starters also Stocked

*Canadian Customers:*

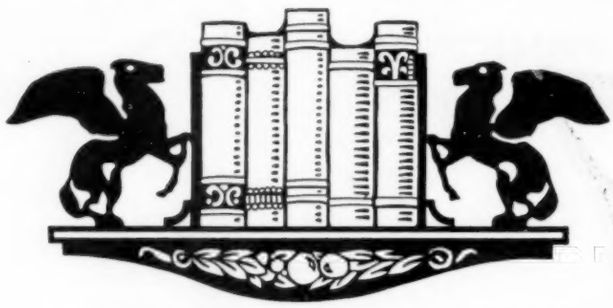
We can ship sets without motors.
CANADIAN GENERAL ELECTRIC
motors will fit.

SEND FOR STOCK LIST

CHANDEYSSON ELECTRIC CO., St. Louis, U. S. A.

WE HAVE IN STOCK

# BOUND VOLUMES



## THE METAL INDUSTRY

(the best of all books)

for the years 1927, 1926, 1925, 1924, 1921, 1920, 1919, 1918 and 1915. Price, $3.00 per volume.

SPECIAL OFFER: A complete bound volume and a year's subscription, $3.50.

## THE METAL INDUSTRY

99 JOHN STREET, NEW YORK

**PRESSED LEATHER WHEEL CO.**

MANUFACTURERS OF

**Cheney Patent Metal Finishing Wheel**

LITTLE FALLS, NEW YORK

Pat. Oct. 16, 1923.

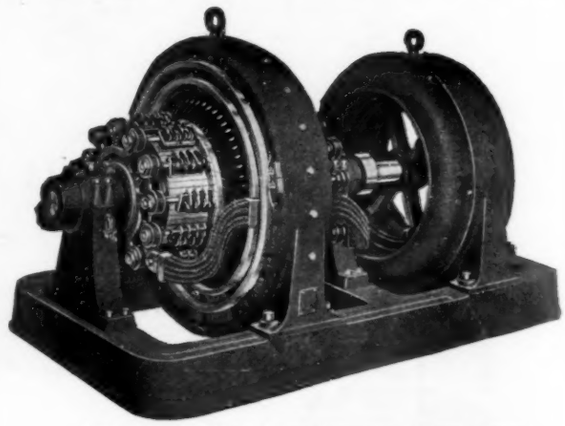
**BEWARE OF ALL IMITATIONS**

**PRESSED LEATHER WHEELS** are patented and are the only **WOOD CENTER WHEELS** that ever stood up to the most rigid requirements. **PRESSED LEATHER WHEELS** are built on the merits and defects of all wheels known to the trade during the past 20 years.

Nothing but the best of materials are used which, combined with perfect workmanship, gives to the trade an ideal coloring wheel, the fastest cutting wheel ever known, built to stand up to the most rigid requirements found in the modern polishing rooms of today and tomorrow.

***(BUILT BY OLDTIME POLISHERS)***

**ELECTRO AND MOTOR GENERATORS**



5,000 Ampere, 6 Volt Motor-Generator, Interpole Type

**THE BEST** for Electro Galvanizing, Electro Plating and all purposes for which low voltage generators are used. We furnish synchronous motors with our large generators. These motors operate with 100% power factor and assist in building up the general power factor in the plant.

Particulars and Catalog on Request

**THE EAGER ELECTRIC COMPANY**

**Watertown** **New York**

# A MESSAGE of IMPORTANCE on Chromium Plating

CHROMIUM Plating, having proved an exceptionally effective resistant to wear, heat and corrosion, has awakened industrial executives and platers everywhere to its possibilities for many industrial uses and as a beautiful and permanent finish for innumerable manufactured products.

In view of this interest it is quite natural that many have experimented with Chromium plating, unaware that although the laboratory process of depositing Chromium electrolytically is a simple one, the successful commercial application of this process is the result of many years of research and experience.

The "Crodon" process of Chromium plating has been developed by the pioneers in the field, through years of experimentation and at a cost of thousands of dollars. Its adoption has enabled manufacturers and platers everywhere to quickly, economically and successfully employ Chromium plating to meet their own peculiar requirements, saving them the inevitable and unnecessary costly expenditure of time and money that follows individual experimentation.

**1 Harder than case-hardened steel!**
**2 Resists heat!**
**3 Immune from atmospheric corrosion!**
**4 Resists all organic acids and alkalis!**

We would welcome an opportunity to fully explain the "Crodon" process of Chromium plating, its economy, application and possibilities, and to acquaint you with the advantages of our engineering cooperative and advisory service.

CHROMIUM CORPORATION *of* AMERICA
General Offices: 120 Broadway, New York

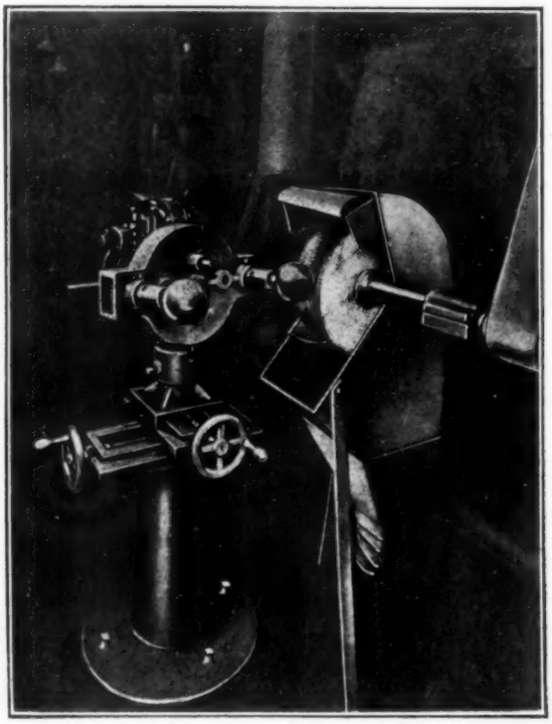
*Branch Offices and Plants:*
4645 West Chicago Ave., Chicago, Ill., 3125 Perkins Ave., Cleveland, Ohio, and at Waterbury, Conn.
*Metal & Thermit Corp., Agents, South San Francisco, Cal.*

# CRODON

TRADE MARK REG. U. S. PAT. OFF.

**THE CHROME PLATE**

**RESISTS HEAT ~ WEAR ~ CORROSION**



# Automatic Buffing

**Pays Large Returns**

Photo shows Type "A" two spindle machine buffing andiron tops.

Firm in Connecticut shows better than 100% savings over the hand method with inexperienced help on the machine. This is just one of the many jobs they do.

Send your samples and let us tell you how to save.

***We Make Other Types***

## Acme Manufacturing Co.

**1645 Howard St. Detroit, Mich.**

# ACID-PROOF POTS

FIG. 88—ACID POT

| | A | B | C | Cap. Gal. | List Price |
|---|---|---|---|---|---|
| Size No. 1 | 14 | 12 | 11 | 5 | $6.00 |
| Size No. 2 | 16 | 15 | 14 | 10 | 9.50 |
| Size No. 3 | 21 | 15¾ | 14½ | 15 | 12.00 |
| Size No. 4 | 23 | 17¾ | 16½ | 20 | 14.00 |
| Size No. 5 | 23 | 19½ | 18 | 25 | 17.00 |
| Size No. 6 | 28 | 19½ | 18 | 30 | 20.00 |
| Size No. 7 | 24 | 24¼ | 25½ | 40 | 24.00 |

All dimensions in inches. Prices subject to discount.

Each Pot is unconditionally guaranteed:

1. to be acid, alkali and corrosion proof throughout the body,—*with or without the glaze.*
2. to be more heat resistant than any other.
3. to give full and complete satisfaction in every respect.

This guarantee is backed up by America's oldest and strongest manufacturers of acid-proof chemical stoneware.

*Our line also includes Stoneware Rectangular Tanks, Dipping Baskets, Pitchers, etc.*

## The U. S. Stoneware Co.

Works (Since 1865) Akron, O.
N. Y. Office: 48 Church Street

FIG 87—STRAIGHT-SIDE POT

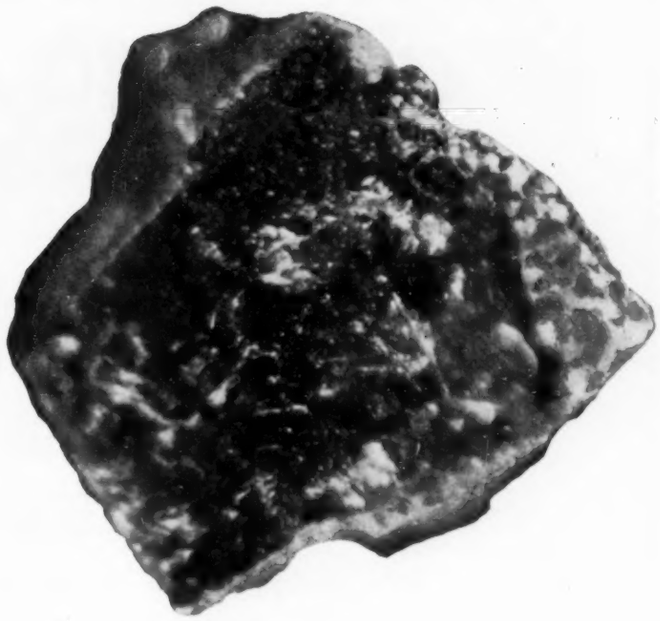
| | A | B | C | Cap. Gal. | List Price |
|---|---|---|---|---|---|
| Size No. 1 | 24 | 26½ | 25½ | 50 | $31.00 |
| Size No. 2 | 24 | 31½ | 25½ | 60 | 40.00 |
| Size No. 3 | 24 | 38 | 25½ | 75 | 50.00 |
| Size No. 4 | 32 | 32 | 34 | 100 | 66.00 |
| Size No. 5 | 36 | 36 | 38½ | 150 | 92.00 |
| Size No. 6 | 36 | 48 | 38½ | 200 | 116.00 |
| Size No. 7 | 43 | 49 | 46 | 300 | 153.00 |

All dimensions in inches. Prices subject to discount.

U.S. ACID PROOF STONEWARE

# If Polishing Grains Were as Large as This—

*Then it would be easy to select good abrasive—grains uniform in size, shape and structure*



But of course it is not possible to pick up the grains of abrasive and examine them individually as you would apples. Yet the size and shape of each single grain is of vital importance to the polisher.

Therefore in the preparation of Norton abrasives a special process is employed which automatically eliminates the poor grains—the "flats" and "slivers" that do no work, the large over-sized grains that scratch. The grains that remain are uniform in size, in shape, in structure—they cut fast and give a fine finish.

In effect the grains are as "hand picked" as though they were selected individually.

**NORTON COMPANY, WORCESTER, MASS.**
New York Chicago Detroit Philadelphia Pittsburgh Hartford
Norton Company of Canada, Limited Hamilton, Ontario

W-173

**NORTON**
**POLISHING ABRASIVES**

# Anniversary Announcement

In January 1928

## THE METAL INDUSTRY

will reach its 25th birthday

January 1903—January 1928

We are planning to celebrate the event by issuing a crack-a-jack

## ANNUAL REVIEW NUMBER

surpassing all other efforts

*Orders for Space and Selection of Inserts Should Be Made at Once*

THE METAL INDUSTRY
99 JOHN STREET
NEW YORK

AUDIT BUREAU OF CIRCULATIONS — ABC — Verifies Quantity

*MEMBER OF*

ASSOCIATED BUSINESS PAPERS — ABP — Verifies Quality

QUILTED CANVAS WHEEL
Used for
Polishing where a solid canvas wheel would be unable to get into shapes that are other than flat.

# POLISHING WHEELS

## BRANDED WITH A DIAMOND

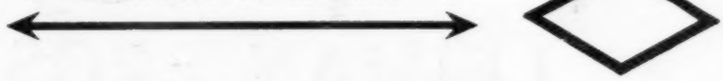
### ARE MANUFACTURED ONLY BY

## ADVANCE WHEEL MFG. CO., Inc.

CHICAGO OFFICE AND FACTORY:
618-622 West Lake Street
Telephone Haymarket 0037

DETROIT OFFICE:
GENERAL MOTORS BLDG.
Telephone Empire 3393

LOOK FOR THE DIAMOND



# THE MEAKER COMPANY

*Manufacturers of Galvanizing Equipment and Electro Plating Machines*

Est. 1899

**Mechanical equipment will cut your plating cost and insure production. Good men are scarce. A machine is always on the job and ready to go.**

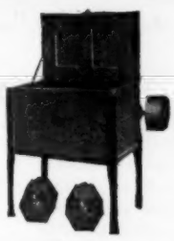
*Write for Illustrated Booklet on our Variable Speed Plating Machine.*

**1249 FULTON STREET** **CHICAGO, ILL.**

Blowers

Polishing Benches

Ventilators



Tubbing

Dryers

Sand Blasts

## THE BOLAND SYSTEMS FOR FACTORY INSTALLATIONS

Tanks, Coloring Rooms, Dynamos, Sawdust Boxes

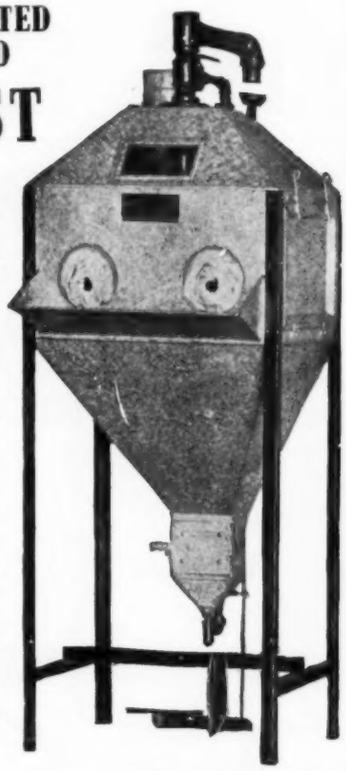
H. J. ASTLE & Co. (Send for Catalogues) 118 Orange Street, Providence, Rhode Island

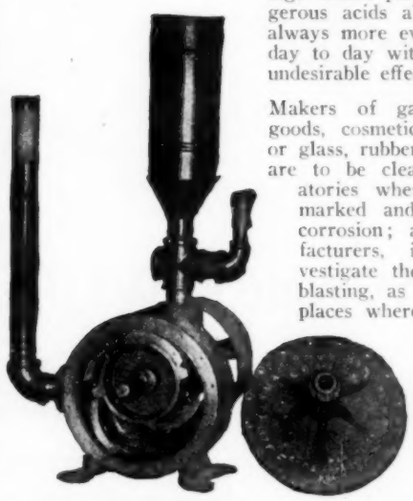
## LEIMAN BROS. PATENTED CONTINUOUS FEED

# SANDBLAST

### This Sand Blast Will Make Money for Metal Goods Manufacturers

and makers of goods in glass, celluloid, hard rubber, wood and other materials by quicker production and superior finishes. No experience whatever is required to operate this outfit so that any boy or girl may be employed at the work without fear of marring or spoiling the work. It can be operated from any power shafting or from an engine or electric motor. A half pail of sand lasts for many days.





An outfit like this feeds the sand automatically and the continuity of the sand flow is controlled by foot pressure. All the work is done inside the cabinet so that the operator is not bothered with dust. He holds the work piece by piece under the nozzle, where the spray of sand quickly produces the mat finish desired.

Quantity work is rapidly done in this way—in fact, it is the most rapid and improved method of doing this work—displacing the scratch brush for mat and silky finishes and for cleaning castings before plating—it displaces dangerous acids also—and the finish is always more even and uniform from day to day without streaks or other undesirable effects.

Makers of gas fixtures, electrical goods, cosmetic containers in metal or glass, rubber goods where moulds are to be cleaned; chemical laboratories where bottles are to be marked and utensils freed from corrosion; all manner of manufacturers, in fact, should investigate the possibilities of sand blasting, as there are unsuspected places where it should have been used years ago. Tell us your mode of manufacture and we will be glad to make recommendations without any obligations on your part whatsoever.

**INFORMATION FREE**

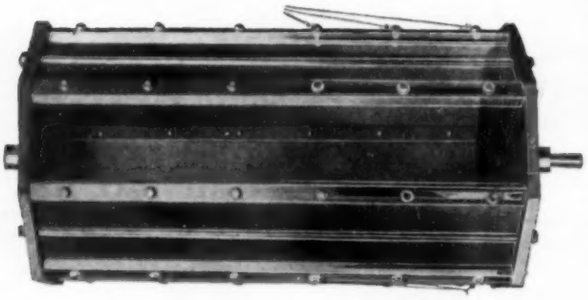
# LEIMAN BROS.

***Makers of good machinery for 35 years***

**23 (J727) WALKER ST. NEW YORK**

# THIS BARREL

## *Plates in Half the Time*



IN actual operation this Mercil Plating Barrel is increasing production from 25% to 100% over old methods. ¶ Made of a specially prepared Bakelite product, with contact arrangement that gives equal distribution of current, the Mercil Barrel plates faster, lasts longer and costs less for upkeep than any other plating barrel. ¶ Write for further information.

MERCIL PLATING EQUIPMENT CO.
1917 Fulton Street, Chicago, Illinois

HANSON-VAN WINKLE-MUNNING CO
*Exclusive Distributors*

## BUILDERS OF OVENS FOR 38 YEARS

STEINER OVENS FOR BEST RESULTS

**STEINER OVENS** for steam, gas, oil or electric heat. Their adaptation to your particular requirements means the utmost in utility and economy. Automatic control.

**SAWDUST BOXES** for steam, gas, electric or kerosene heat.

**Trucks, trays, tanks and thermometers.**

***Send for Catalog M***

**E. E. STEINER & CO., 197 E. Kinney St., Newark, N. J**

## *GET BETTER RESULTS*

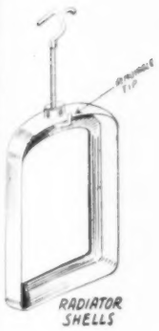
USE

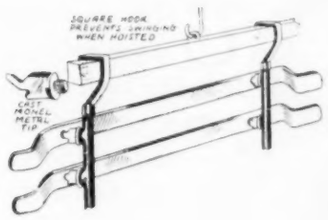
# CORCORAN PLATING TANKS

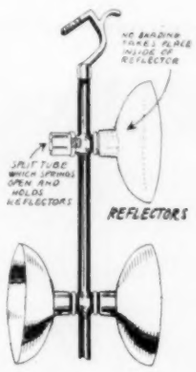
**A. J. CORCORAN INC.**

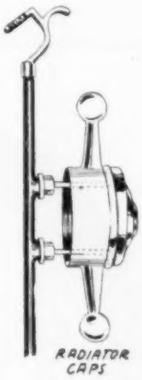
749 Jersey Avenue
JERSEY CITY, N. J.

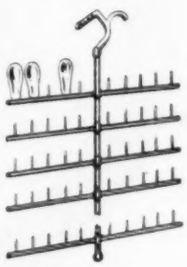
Established 1865

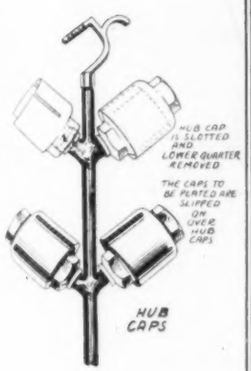


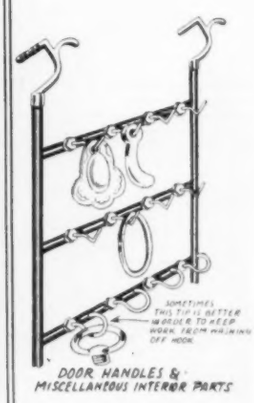







# Plate Three Times Faster

**Obtain a More Uniform Deposit with the**

## Lustre Vertical Motion Plater

*No New Tanks Necessary*

**Place this apparatus on one of your old tanks**

**The first cost is not prohibitive**

## —FOR ELECTRO PLATING,

**Cadmium, Nickel, Silver, Zinc, Brass, Copper, etc.**

*Write for Bulletin 201*

## THE LUSTRE CO., Inc.

**20th and Obear, St. Louis, Mo.**

*MANUFACTURERS*

**Plating and Polishing Supplies and Equipment**

**Complete Plating Plants.** **Send for Catalog.**

*THE approaching holiday season reminds us that another year is drawing to a close. This seems an opportune time to express to you our sincere appreciation for the good will which you and others have entrusted to us during 1927.*

*We greatly cherish the confidence and consider it as our most prized business asset.*

*In future it will be our constant endeavor to render through*

**METEX**
**METAL CLEANER**

*service that will merit a continuance of this trust.*

# MACDERMID INCORPORATED

WATERBURY *MANUFACTURERS* CONNECTICUT

# F. L. & J. C. CODMAN CO.

## MANUFACTURERS

Factories:
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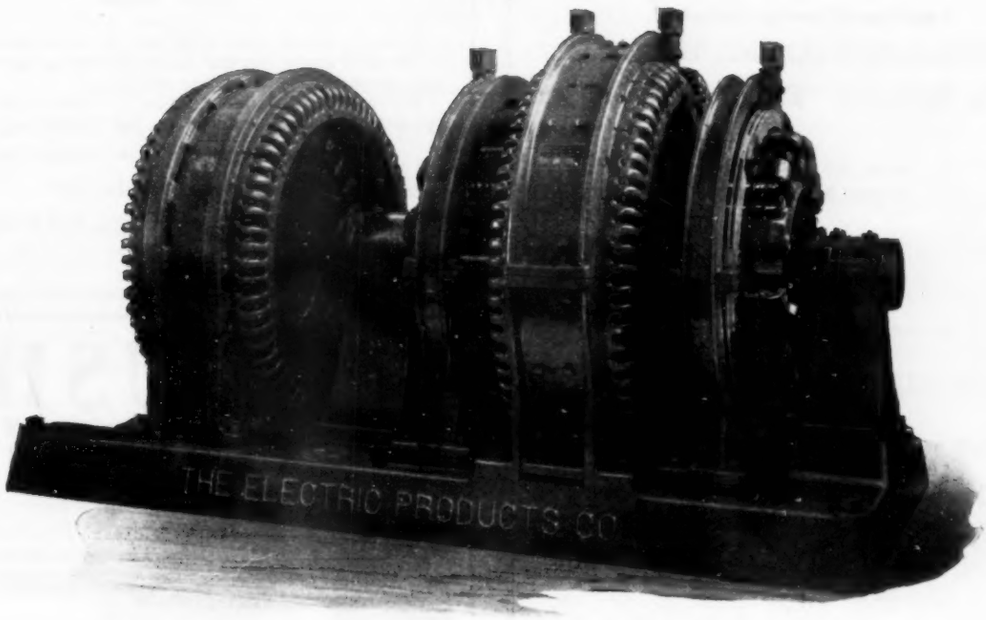
13440 Klinger Ave., Detroit, Mich.

Salesroom:
82 Duane Street,
New York, N. Y.

Standard - Grade - Buffs
Loose - or - Sewed
Pieced - or - Whole Layers
Canvas - Muslin - Sheepskin
Write - for - prices.

MOTOR GENERATOR PLATING SETS




A TYPICAL EXAMPLE of a standard E-P Electro-Plating Generator of 7500 Amperes capacity at 6 volts, or 3750 Amperes at 12 volts is shown above. Note particularly the rugged construction of the brush holders, brush holder supports, and bus.

E-P Electro-Plating Generators are built in capacities from 50 to 15,000 Amperes and every size embodies throughout the same high standards of design and construction.

*Bulletin 90 fully describes this equipment. Write for copy.*

Manufactured by

The Electric Products Co.
Cleveland, Ohio.
1723 Clarkstone Road

"Sergeant Burr Nish"

## Sergeant Burr Nish Says:

*The quality of the steel balls you use in your Polishing and Burnishing Barrels are the deciding factors in the finish of your products.*

STEEL BALLS FOR BEARINGS STEEL BURNISHING BALLS
METALLIC BURNISHING MATERIALS

*Send us your Burnishing Problems. Our Engineers are at your service.*

**THE HARTFORD STEEL BALL COMPANY**
609 Franklin Ave., HARTFORD, CONN.

## AMERICAN TRIPOLI COMPANY

(Incorporated 1892)
Subsidiary of Barnsdall Corporation
SENECA, MISSOURI, U. S. A.
Cable Address: "Tripoli, Seneca"

Codes: A B C 5th & 6th
Marconi: Bedford-McNeil

*Seneca Standard Tripoli*

*"Be Square" Products*

## LUPOMATIC IMPROVED POLISHING MACHINE

(Motor Driven)

Made in seven sizes with one to seven compartments. We also make several sizes of cutting down, grinding and smoothening tumbling machines.
We carry a complete stock of steel balls, ballcones, spickets, diagonals and soaps for burnishing purposes.

WE SOLICIT ARTICLES FOR DEMONSTRATION

*Send for Circular 27B*

Lupomatic Tumbling Machine Co., Inc.
3638 Park Avenue New York City

BEFORE BUYING—

## NICKEL ANODES

IN ANY SIZE, SHAPE OR PERCENTAGE

*"Secure Our Prices"*

WE ALSO MAKE COPPER, BRASS, BRONZE AND ZINC

ANODE CORPORATION OF AMERICA

*New York Office:*
27 CLEVELAND PLACE

FOUNDRY: SAUGERTIES, N. Y.

## BRUSHES

Brass, Copper and Steel Wire Brushes
An assortment of
Machine and Circular Brushes
Chandelier Manufacturers', Silver and Nickelplaters' Brushes, Etc.
Repairs Promptly Attended to

H. BLUMENTHAL & CO., MFRS.
ANDREW H. LAU, Sole Proprietor
241-243-245 CENTRE ST., NEW YORK
Ask for Catalog "M"

## BUFFS

**Dred-Knot Par-X Rain-Bo**

FIRST QUALITY MATERIAL USED AND MADE BY FIRST CLASS OPERATORS INSURING A PERFECT BALANCED BUFF.

*Send Us a Trial Order and Compare Them With What You Are Now Using*

**INDIANA BUFF COMPANY**
P. O. BOX 979, SOUTH BEND, INDIANA

# The New Depolarized Soluble Nickel Anode

## *A marked improvement in High Purity Anodes*

RECENT EXPERIMENTS have developed an anode which, in addition to all the proven advantages of the 99+% rolled-heat-treated anode, corrodes more uniformly and dissolves more readily. This new anode remains bright in the plating solution and has a lower polarization. For this reason it is called the Depolarized Soluble Nickel Anode, so as to emphasize its important new properties.

It has been known for some time that a cast nickel anode, having an oxide content within definite limits, corroded more evenly and had a higher efficiency than any other cast nickel anode. When this feature was combined with the proven qualities of the 99+% rolled-heat-treated anode, an ideal anode was produced.

In cast anodes the tendency of the nickel oxide present is to become isolated along the intercrystalline boundaries of the metal, so forming a non-adhesive and readily soluble film. This film dissolves in solution, thus freeing metallic particles which fall to the bottom of the tank or are carried over to the cathode. But, by working such metal, preferably rolling under proper conditions, the crystals and intercrystalline oxide film can be broken up and distributed through the mass, so that in the subsequent regrowth of the crystals the nickel oxide becomes distributed uniformly throughout the mass of the metal, rather than in a film along the intercrystalline boundaries.

The foregoing process results in the production of a strong, uniformly soluble, active metal which, when rolled into appropriate shapes, results in practically a perfect anode—the Depolarized Soluble Nickel Anode.

### ADVANTAGES

1 **More Uniform Deposit**
It gives a more uniform deposit because of the better current distribution.

2 **More Constant Solution**
It maintains the solution more nearly constant in nickel content, and so minimizes its care, since the anode has less tendency to become coated with insoluble films.

3 **Fewer Rejections**
It reduces the percentage of rejections, and so minimizes subsequent buffing operations, for the solution is clean and free of metallic particles which tend to roughen the deposit.

4 **Less Waste Nickel**
It reduces the waste of nickel because it corrodes smoothly and uniformly from beginning to end.

5 **Less Power Consumed**
It reduces the power consumption because it permits the use of higher amperage at a lower voltage.

6 **Equitably Priced**
It is priced the same as other types of high purity anodes now on the market.

**Our latest offering to the trade as a further contribution to better plating**

*Place a trial order and watch results*

## HANSON-VANWINKLE-MUNNING COMPANY

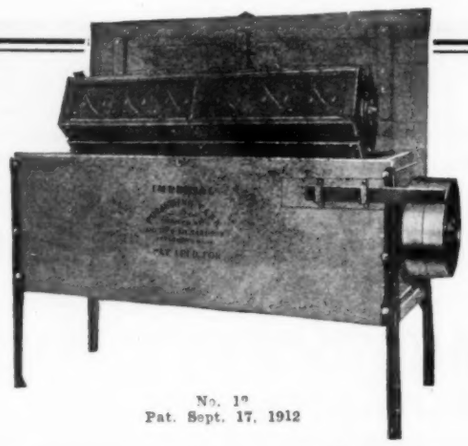
MANUFACTURERS OF

Electroplating & Polishing Equipment & Supplies

MATAWAN, NEW JERSEY

*Factories:* MATAWAN, NEW JERSEY; NEWARK, NEW JERSEY; CHICAGO, ILLINOIS · *Sales Offices in all principal cities*

# *Imperial Patented Multiple*



No. 1
Pat. Sept. 17, 1912

# *Compartment Machines*

are made to withstand production strains. These machines positively cut polishing costs.

These machines are made in sizes from two to six compartments. Unequalled for the manufacturer who wishes to polish a number of different kinds of small parts at one time and keep each kind separate.

We make seven stock sizes of this machine and can build them in special sizes if wanted.

We also build several sizes of single compartment machines and carry a complete stock of steel balls, cones, spickets and soap powder for burnishing purposes.

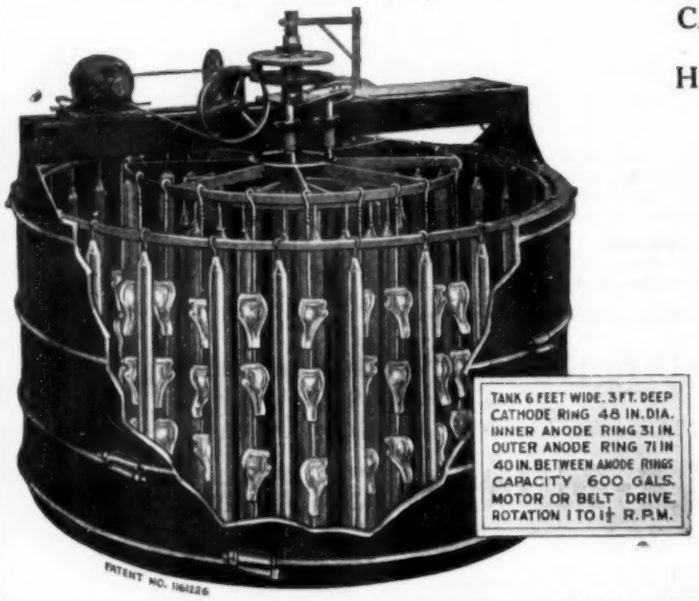
*We Solicit Articles for Free Demonstration*

## Smith, Richardson Co.

Attleboro, Mass.

## RICHARDS ROTARY PLATER

**Electrodes Revolve Reversely**


TANK 6 FEET WIDE. 3 FT. DEEP
CATHODE RING 48 IN. DIA.
INNER ANODE RING 31 IN.
OUTER ANODE RING 71 IN
40 IN. BETWEEN ANODE RINGS
CAPACITY 600 GALS.
MOTOR OR BELT DRIVE.
ROTATION 1 TO 1½ R.P.M.
PATENT NO. 1161226

**WHEN GALILEO DISCOVERED THE WORLD'S ROTATION, HE WAS CALLED CRAZY.**

**HE WAS AHEAD OF THE TIMES**

**WE ARE AHEAD OF THE TIMES WITH OUR ROTARY PLATER**

**BUT WE ARE NOT CALLED CRAZY**

THIS FAST MOTION PLATER IS BEING INSTALLED, WHEREVER SPEED PLATING IS REQUIRED.

**GET IN THE LEAD WITH THE**

***RICHARDS ROTARY PLATER***

**Made in 3 Sizes**

WRITE FOR BULLETIN 104

## LASALCO

**INC. 2828-38 Lasalle St.**
**Mfgrs. ST. LOUIS, MO.**

**LASALCO BUFFS ARE PRODUCTION GETTERS AND COST SAVERS**
**THE BUFFS LAST BUT THE BUFFING DOESN'T**
**LASALCO COMPOSITIONS STICK TO THE BUFF, BUT NOT TO THE WORK**

**EVERYTHING FOR POLISHING AND PLATING**

*Write for Prices*

# You Can Filter Plating Solutions and Clean Your Tanks

## *for Less Than One-Half Cent a Gallon*

**This includes the cost of filter machine and your labor**

Patent pending

**Interchangeable Filter Set**

**For increasing daily capacity of machine or changing from acid to cyanide solutions.**

Tremendous savings are effected when plating solutions are kept clean. Full benefit is derived from all amperes generated as anodes do not become slimy and increase resistance. Throwing power of solution is greater, work can be handled in and out of bath quicker, and rough or pitted articles eliminated, saving many rejections from the buffing room. Additional savings are made in plants that often scrape away 50 per cent of metal to clean adode surface from slimes that occur when solutions are dirty.

Chromium, Nickel, Cadmium, Silver, Copper, Brass and Zinc solutions used in still plating, mechanical tanks or big automatic units can be filtered with our machines without having to empty tanks or necessity of big extra storage tanks.

We make various sizes of filter machines and all outfits are sold on guarantee to filter perfectly at stated capacities.

These machines are not expensive. We will cheerfully make quotations and recommendations. Just let us know the kinds of solutions to be filtered, sizes and number of tanks of each, and whether alternating or direct current is used, and we will quote on proper equipment.

---

## Use Rubberline and Reduce Upkeep Costs

Rubberline contains 35% rubber, also other acid and alkaline resisting compounds and will stand temperatures up to 150 degrees. If coated with Rubberline, steel tanks will do on nickel solutions, steel washing tanks will not corrode and wet wood tanks can be lined immediately with smooth coating that will not strip.

Rubberline is put up in 25 pound cans, melts quickly in shipping container and weighs 1¼ pounds per square foot ¼" thick.

**1 Can Lot 22c lb.** **4 Can Lots 16c lb.** **12 Can Lots 15c lb.**

# INDUSTRIAL FILTER & PUMP MFG. CO.

**359-361 W. ONTARIO ST.** **CHICAGO, U. S. A.**

# HF&G

| NICKEL | COPPER | CADMIUM |
|---|---|---|
| ANODES | ANODES (Cast, Rolled and Electro Dep.) | ANODES |
| SALTS | | OXIDE |
| CHLORIDE | SULPHATE | SULPHATE |
| FLUORIDE | CARBONATE | HYDRATE |
| CARBONATE | CYANIDE | CHLORIDE |

**CHROMIC ACID, CHROMIUM SULPHATE, CHROMIUM CARBONATE**

BRASS, BRONZE, TIN and ZINC ANODES

## The Harshaw Fuller & Goodwin Co.

545 Hanna Bldg.
CLEVELAND

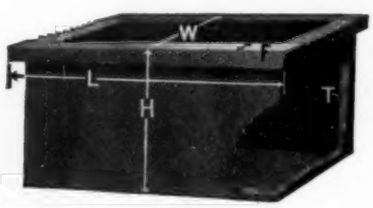
150 Nassau St.
New York

Jackson & Swanson Sts.
Philadelphia

107 No. Market St.
Chicago

# EVERLASTING PLATING TANKS

*MADE IN ONE PIECE*
*NO JOINTS*




*CLEAN AS A CHINA DISH*

MADE OF ACID-PROOF CHEMICAL STONEWARE, THE MATERIAL USED IN THE CHEMICAL INDUSTRY FOR THE MANUFACTURE OF ACIDS AND OTHER CORROSIVE PRODUCTS.

*WRITE FOR DESCRIPTIVE BULLETIN AA*

| | |
|---|---|
| TANKS | PUMPS |
| POTS | EXHAUST FANS |
| PIPES | ETCHING TUBS |
| VALVES | PHOTO ENGRAVING EQUIPMENT |

## GENERAL CERAMICS COMPANY

225 BROADWAY, NEW YORK

SAN FRANCISCO, CALIF., 276 MONADNOCK BUILDING
CHICAGO, ILL. 208 SO. LA SALLE STREET

# CROWN BARRELS

## FOR PLATING AND FOR TUMBLING

CROWN Improved Oblique Plating and Tumbling Barrels are the biggest value on the market today. They are the sturdiest of any — heavier and better designed than any barrels so far produced. They cost no more than the ordinary barrels.

The illustration shows the new Plating Barrel. The tumbling barrels are of similar construction and may be had with wood or steel tubs, and the cylinders can be furnished tapered toward the top or toward the bottom as you wish.

*Everything for Polishing and Plating*

### Belted or Electric Drive

The modern tendency is toward electric drive. We are now selling about half belted and half direct electric drive.

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The new Crown design chain hoist on these barrels is the easiest to operate of any we have tried.

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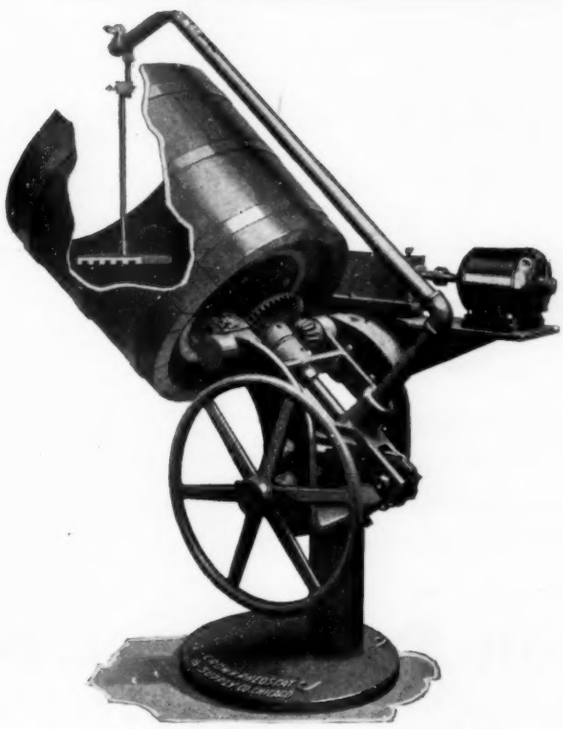

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Every part designed to do its work.

---

No under-sized gears to break with resultant loss of labor, solution and work.

---

Most efficient plating barrel on the market for nickel, brass, copper and bronze plating small parts such as screws, bolts, washers, tubes, etc.

---

Every bearing fitted with an accessible oil cup.

---

CROWN Tumbling Barrels are excelled only by CROWN Plating Barrels.

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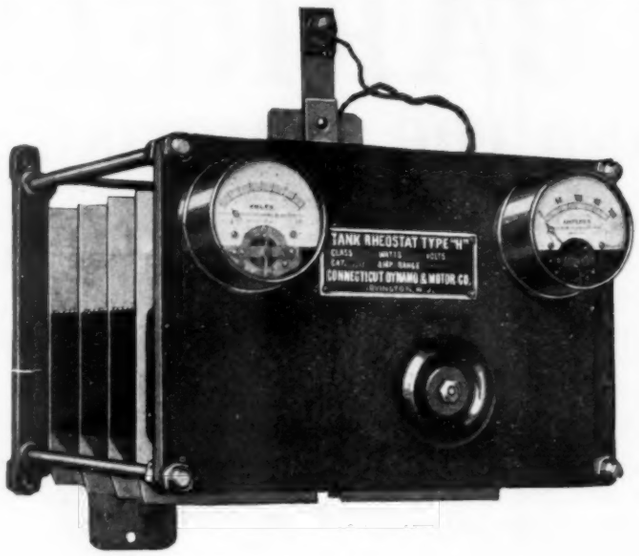
**Manufactured by the one company having a combined practical and engineering personnel**

## Crown Rheostat & Supply Co.

**1910 Maypole Avenue** **CHICAGO**




# Type "H" Tank Rheostat

will regulate the voltage at the tank from zero to the full voltage of the dynamo, whether the tank is full of work or only one small piece is to be plated.

## CONNECTICUT DYNAMO & MOTOR CO.

196 Lyons Ave., Irvington, N. J.

***Manufacturers of Improved American Giant Plating Dynamos. The Rotoplater—the Simplified Plating Barrel.***

CXM

TRADE MARK REG. U.S. PAT. OFF.

Magnuson Industrial Cleaner Formulas have been extended, modified, and created to fit every industrial need.

## Let us solve your cleaning problems scientifically

THERE are a great many places in your establishment where the selection of the exact right kind of cleaner—and its proper use—will be reflected in your profits. We have been able to speed up manufacturing processes, cut down costs, waste, and expense, and stop a lot of returns. A very large list of prominent users is the result. We will be glad to consult.

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SUCCESSFUL

# CHROMIUM PLATING

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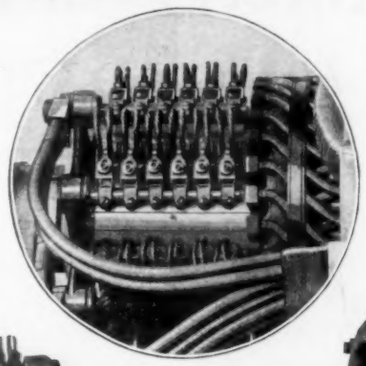
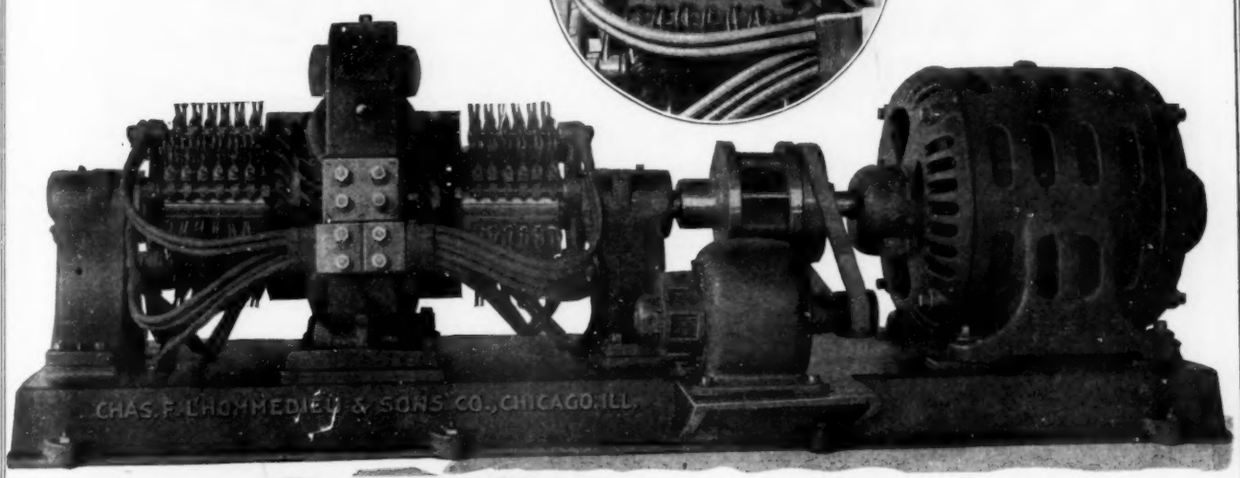
## RELIANCE MOTOR GENERATOR SETS and RHEOSTATS

We are manufacturers of Reliance Dynamos from 75 to 10,000 amperes. For electrical and mechanical efficiency, large capacity, and coolness under full load, Reliance Dynamos are unexcelled.





Type "K" Reliance Rheostat with Volt and Ampere Meters

## Reliance Chromium Rouge

Completes the Trinity
of
The Three Vital Factors
for
The Production of Beautiful and Economical Chromium

Let Us Tell You of Some of Our Greater Installations and of the Larger Consumers of Reliance Chromium Rouge.

## CHAS. F. L'HOMMEDIEU & SONS CO.

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## QUALITY CHEMICALS
## *Plus* SERVICE

THE number of our friends who have relied upon us for years to keep them supplied with platers' chemicals is large. They know that at any time they can call upon us for assistance. It is practical help in solving problems—cooperation unobtainable thru other sources except perhaps at heavy expense. Such service is rendered gratis to our customers as part of the sale.

*A partial list of*
*R & H products*

CYANEGG —The undisputed standard for Sodium Cyanide 96/8%.

Metal Cyanides
—Copper, Zinc, Silver, Gold.

*CHROMIC ACID*
—Ask for formula.

Sodium Stannate
—Best basis for electro and contact-tinning.

Polysulphide
—Ideal oxidizing agent for copper, bronze and silver.

Sodium Sulfocyanide
—for black nickel plating.

CARBONATE COPPER AND ZINC

Caustic Potash and Soda,
Trisodium Phosphate

For an inexpensive, yet attractive Black on Iron or Steel—

*use*

R&H

*Hydrogen Acid Process*

Full particulars on application

*The*
**ROESSLER & HASSLACHER CHEMICAL COMPANY**
**709 SIXTH AVENUE, NEW YORK, N. Y.**

Entirely Automatic Cleaning, Plating or Galvanising & Drying Unit.

Rotary Cleaner, Pickle, Acid Dip, Neutraliser, Rinse & Drying Unit.

Generators and Motor Generator Sets for Plating, Galvanizing, Cleaning, Etc.

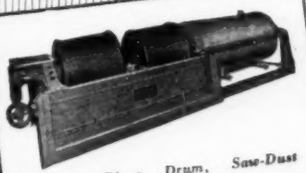
Moving Cathode Plating or Galvanizing Unit.

Rotary Saw-Dust Dryer & Separator.

Automatic Conveyor Dryer.

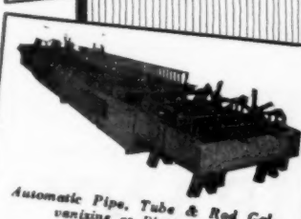
Drum, Saw-Dust Dryer & Separator. Single Rinse

Self-Emptying Plating Barrel.

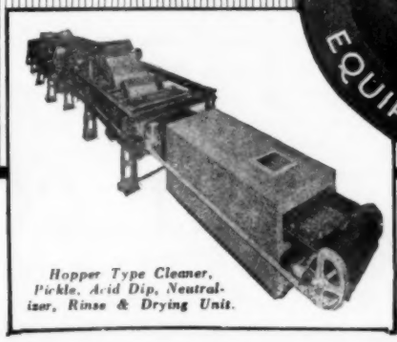


Double Rinse Drum, Saw-Dust Dryer & Separator

Alternate Rotating Plating Barrel.



Automatic Pipe, Tube & Rod Galvanizing or Plating Unit



Hopper Type Cleaner, Pickle, Acid Dip, Neutralizer, Rinse & Drying Unit.

**EQUIPMENT FOR**
**PLATING**
**ELECTRO-GALVANIZING**
**CLEANING**
**PICKLING**
**ACID-DIPPING**
**NEUTRALIZING**
**RINSING**
**DRYING AND**
**ALLIED OPERATIONS**

**ENTIRELY AUTOMATIC**
**SEMI-AUTOMATIC**
**HAND-OPERATED**

**GENERATORS**
**MOTOR-GENERATOR SETS**

*Single Units* *Complete Plants*

**U. S. Galvanizing & Plating Equipment Corporation**
**82 Stockton Street Brooklyn, N.Y.**

**Manufacturers**
**Incorporated 1896**

U.S. GALVANIZING & PLATING
US
EQUIPMENT CORPORATION

1896 1927

# U. S. A. Brand

## The Felt Wheel That Increases Your Profits

**by**

**Polishing ¼ to 1/3 more parts**

**Weighing less per wheel**

**Cutting down upkeep charges**

To any reliable firm desiring to make a test of this wheel against any other manufactured we will forward on information designating size, hardness and arbor hole, a sample wheel not to be paid for unless it proves above statements.

**We have specialized on Felt Products for thirty-one years under the same management**

**We have every confidence in stating U. S. A. Brand has lowest total cost of any wheel manufactured**

### SHEET FELT

Standard sheets 36 x 36 Standard Thickness ⅛" to 4"

Other sizes made as ordered

For special classes of work we make special felts, these felts are being used by manufacturers of leather, glass, brass, shoes, etc.

***Figure out cost on sheet basis not by the pound and note result***

MANUFACTURED BY

## EASTERN FELT COMPANY

**Office: 10 High St., BOSTON, MASS.** **Factory: WINCHESTER, MASS.**

# The Importance of Tripoli Composition

If you are in the Metal Finishing Business, the saleability of your product depends on its finish.

In 75% of the Metal Finishing Business, Tripoli Composition is used to perform the principal polishing operation on which the final finish depends.

To do all that is possible with Tripoli Composition is not only economy but quite necessary if a final brilliant luster is to be obtained. Therefore the most effective Tripoli Composition is essential.

One grade of Tripoli Composition may be exactly suitable for Aluminum—another for Automobile Hardware—another for Brass Goods—another for Spun Ware. Yours may be one of a dozen different problems.

Again you have a certain standard to maintain—you have a certain buff speed—you have local conditions—all of which must be considered in the selection of the proper grade of Tripoli Composition to give the best results.

We have a grade of Tripoli Composition to meet every condition. We maintain a chemical and physical laboratory to help work out your problems.

***Samples on request.***

## We Suggest for the Final Finishing Operation

**NEW**
**UNION MAID**
**LIME COMPOSITION**

A Composition with just enough grease for buffing Nickel over Iron or Steel.

*Write for samples.*

**NEW**
**WHITE ROSE**
**LIME COMPOSITION**

A dry Lime Composition for buffing Nickel over Copper or Brass or wherever a drier composition is required.

*Write for samples.*

# FREDERIC B. STEVENS, Inc.

**INDIANA**
Hoosier Supply Co.,
188 South Delaware Street
Indianapolis, Ind.

**NEW ENGLAND**
Frederic B. Stevens, Inc.
51 Chestnut Street
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Manufacturer of Foundry, Electro-Plating and Polishing Supplies and Equipment
Cupola Blocks, Fire Brick and Clay

**Corner of Larned and Third Streets**
**DETROIT, MICH.**

**PENNSYLVANIA**
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**TORONTO**
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**IN CANADA: Warehouse and Facing Mills: Frederic B. Stevens of Canada, Ltd., Windsor, Canada**

# SEYMOUR PRODUCTS

HIGHEST QUALITY

## NICKEL ANODES

ROLLED OR CAST IN ALL COMMERCIAL
SIZES, SHAPES AND PERCENTAGES
BRASS, BRONZE AND COPPER ANODES

**THE SEYMOUR MANUFACTURING CO.**
SEYMOUR, CONN.
Established 1878
N. Y. SALES OFFICE, WOOLWORTH BLDG., N. Y. CITY
*Western Distributors: Crown Rheostat & Supply Co., Chicago, Ill.*

CLEN ESCO

## Cleans Metals Thoroughly

Let *us* do *your* experimental work in cleaning. It's our business and we are equipped to do it.

COWLES CLEANERS

THE COWLES DETERGENT COMPANY
7016 Euclid Avenue CLEVELAND, OHIO

*"Built for Service"*
THE LATEST **ECONOMY No. 11 AIR SPRAYER**
Light in Weight
Will apply Lacquers, Paint, Enamels, Bronzes, Etc.—Standard Mason Jar
Metal Jars Furnished If Requested

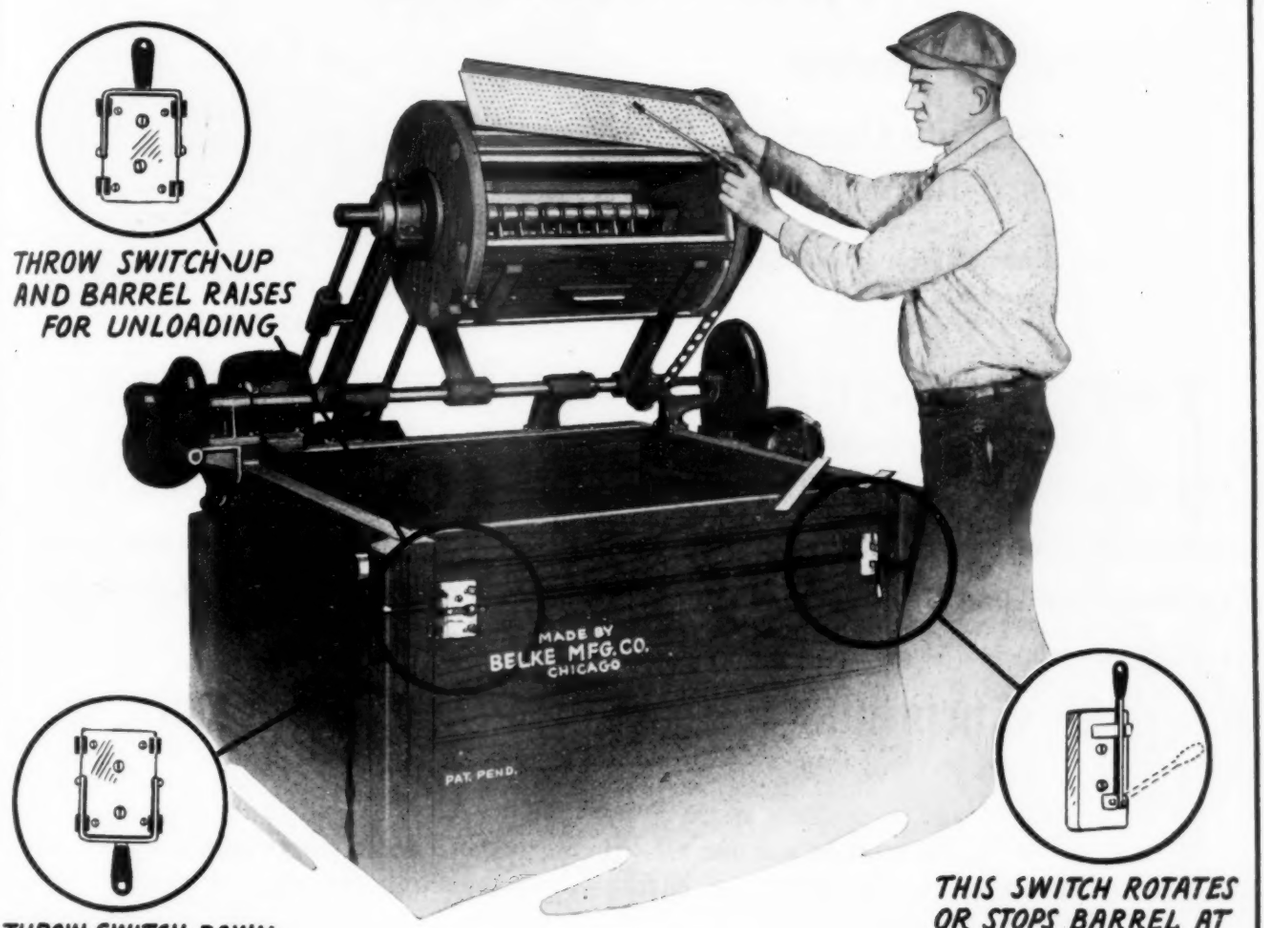
Price - - - $10
SIMPLE DURABLE PRACTICAL ECONOMICAL
Circulars on request
MANUFACTURED BY
Economy Machine Products Co.
5212-14 Lawrence Ave., Chicago, Ill.
SOLD BY ALL LEADING DEALERS

# KALYE

(Trade Mark)

FOR PREPARING METAL SURFACES FOR PLATING, &c.
SAMPLE CAN SENT FREE
Correspondence Solicited Mention This Journal
H. M. ANTHONY CO., Agent
261 Greenwich St., New York

# The Improved BELKE Electric PLATING BARREL


THROW SWITCH UP AND BARREL RAISES FOR UNLOADING
MADE BY BELKE MFG. CO. CHICAGO
PAT. PEND.
THROW SWITCH DOWN AND BARREL LOWERS TO PLATING POSITION
THIS SWITCH ROTATES OR STOPS BARREL AT ANY DESIRED POSITION

A new step forward in plating equipment. As perfect and easy to operate as an automobile. Push the switches and the Belke Electric Plating Barrel does the rest. No pulleys. It raises, lowers and rotates by electricity. Just plug it into the nearest socket. Perfect insulated electric connections. All wearing parts replaceable. No more expensive than the inefficient type. Order today.

*CLIP HERE AND MAIL TODAY—IT WILL BRING FURTHER INFORMATION ON THE IMPROVED BELKE ELECTRIC PLATING BARREL*

## BELKE MFG. CO.

**2952 W. Van Buren Street** **CHICAGO**

# *WHY NOT?*

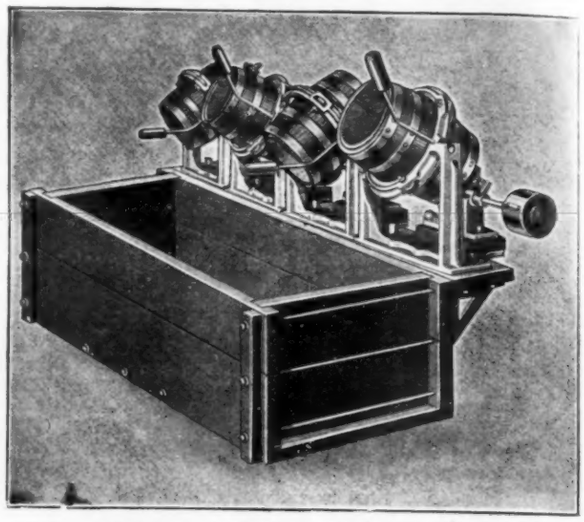
Attach one or more of these small plating barrels to your still tanks.

***Very Convenient***

Solution, Two Quarts
5-6 Volts, 6-10 Amperes

***We carry a large stock of supplies for complete plants***

**Type T. Patented. Write for Circular**



MADE IN TWO LARGER SIZES

**THE DANIELS & ORBEN CO., Inc.**

***Electroplating and Polishing Equipment and Supplies***

**81 Walker St., NEW YORK CITY** **353 Mulberry St., NEWARK, N. J.**

## A Christmas Message From Boissier

• • •

Boissier wishes one and all—their customers and those who are not yet their customers—a Merry Christmas and the Joy of the Holiday Season.

It is Boissier's aim to continue this spirit throughout the entire year; giving of their best in knowledge and experience, in quality and delivery, in continued interest after orders are placed and goods installed, and giving to all even better than a square deal.

The spirit of making lasting friends, rather than mere customers, seems worth while to Boissier. Your friendship is solicited, your patronage will follow.

• • •

BOISSIER ELECTRIC CORP., 100 Walker St., New York City

••• *ELECTROPLATING and ELECTROTYPING EQUIPMENT and SUPPLIES* •••

# 99 +
# NICKEL ANODES
## MALLEABLE CASTINGS

*Deloye Patented or Any Other Shape*

Also

*ROLLED AND ANNEALED 99+*

Improved Deloye

No Hard Surface Shell
Anodes Work Immediately
No More Anode Scrubbing

Solutions Always Clean
Clear Bright
Nickel Plate

## AHCOLOID METAL CLEANER

For Cleaning

ZINC—ALUMINUM—DIE CASTINGS—SOLDERED BRASS

Safe Cleaner on All Metals

## TRIPOLI COMPOUNDS

For

Production—Easy Cleaning—Economy

*Representatives*

E. A. Ireland .....211 W. La Salle Ave., So. Bend, Ind.

W. H. Wilcox }
M. W. Schwarz } .....30 Church St., New York, Room 423

*Phone Cortlandt 3884*

J. J. Siefen .....501 So. Franklin St., Greenville, Mich.

# APOTHECARIES HALL COMPANY
## WATERBURY, CONN.

EST. 1849

LACQUER IT WITH ZELLAC

ZELLAC

# 1928

In 1928 and the future years, you are interested in those who are looking ahead. Your view naturally includes the source of your lacquer supply. Has that manufacturer *vision* combined with the right practical experience?

Zeller prestige in lacquer-making reaches back almost half a century. Ideals considered unattainable 50 years ago have become everyday practice. And to-day the name of Zeller still stands for an organization which copes with present and future lacquer-finishing problems on a basis of progressive ideals plus the most complete lacquer-making experience.

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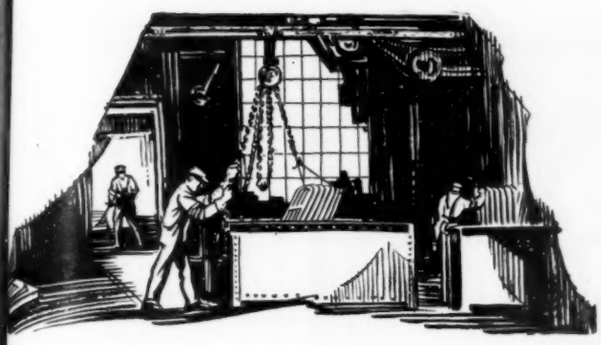

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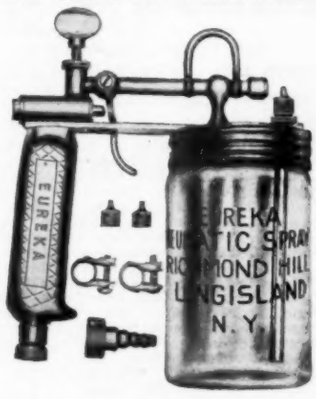


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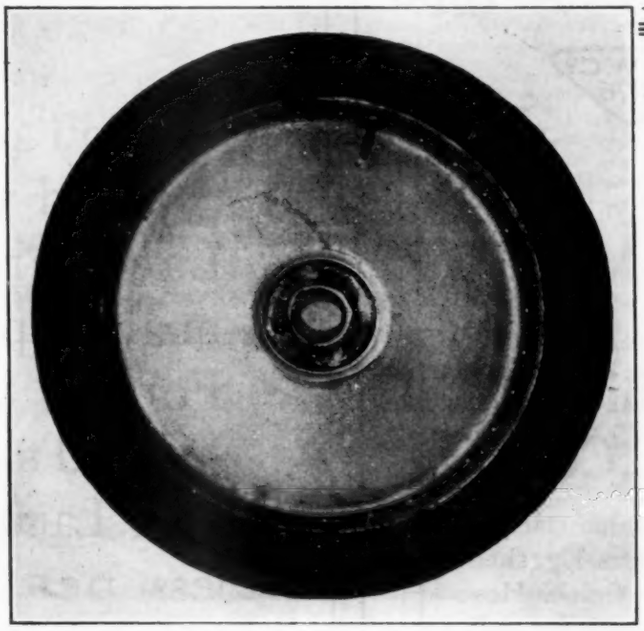

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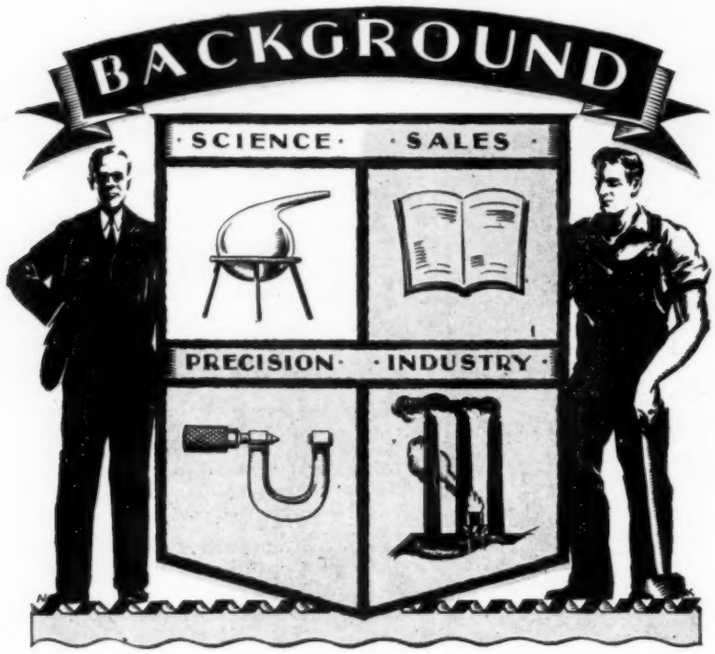


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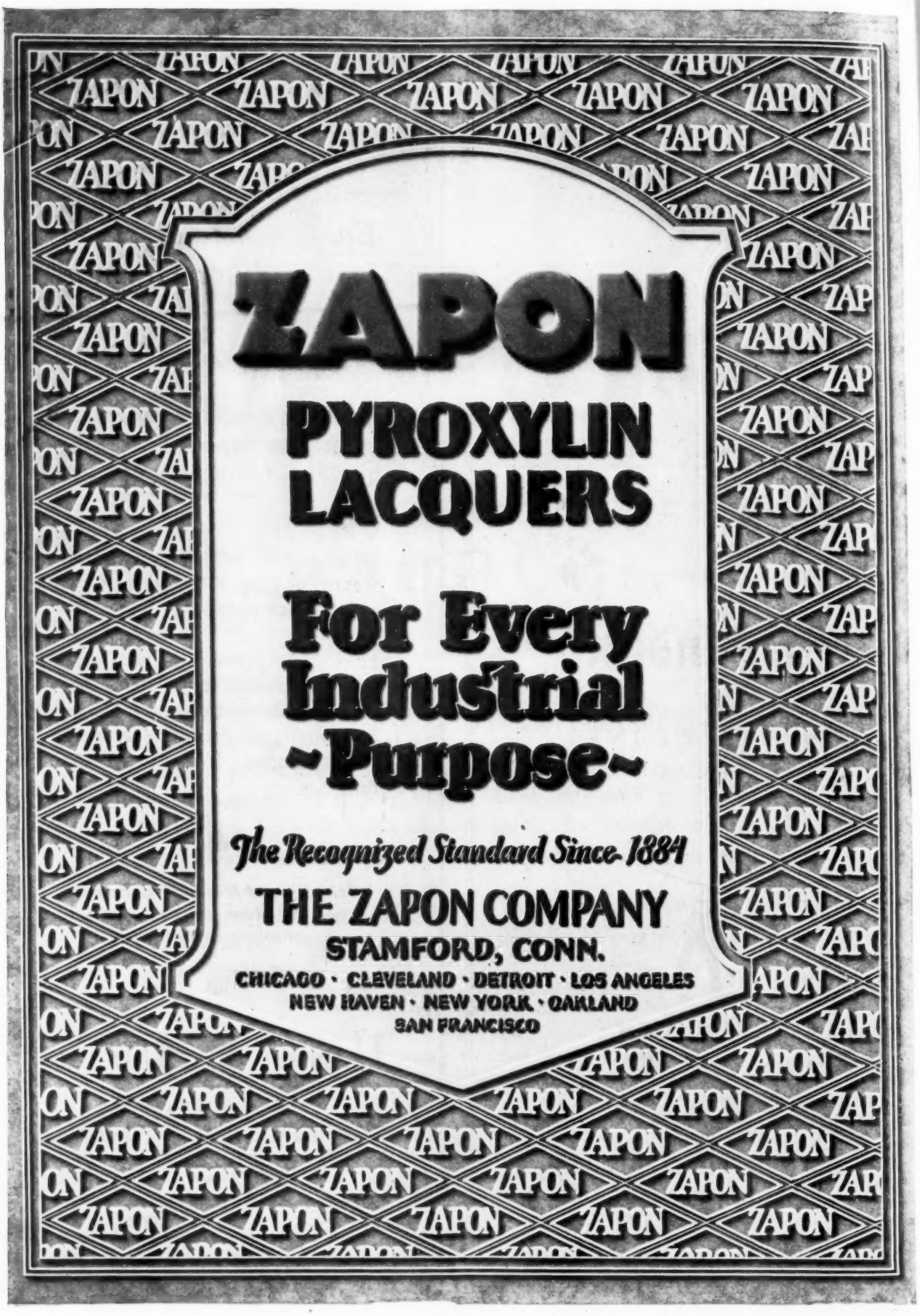
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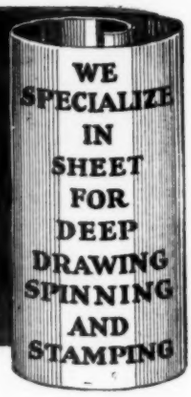


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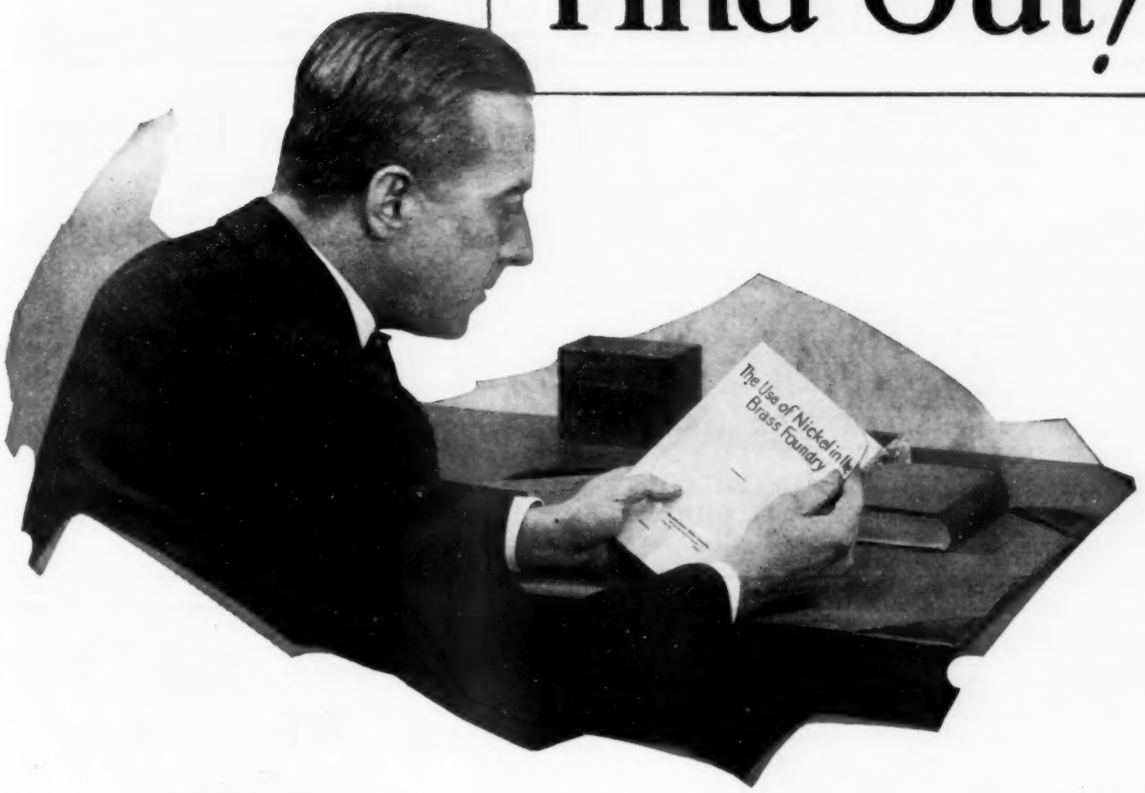


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### PRODUCERS, ALSO BUYERS AND SELLERS OF NEW AND OLD METALS

Established 1789

**NATHAN TROTTER & CO.**

| | | |
|---|---|---|
| Pig Tin | Ingot Aluminum | Ingot Copper |
| Pig Lead | | Shot Nickel |
| Slab Zinc | | Antimony |

36 No. Front St.
PHILADELPHIA, PA.

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**Save Money—Ask Our Prices**
ON
**INGOT COPPER OR COMPOSITION**
**PIG OR BAR TIN**
**HORSE HEAD OR BELMONT SPELTER**
ALL VIRGIN & SCRAP METALS IN STOCK
—LABORATORIES ON PREMISES—

**Belmont Smelting & Refining Works, Inc.**
Gen'l Offices—332 Belmont Ave., Brooklyn, N. Y.

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WANTED

**SCRAP NICKEL ANODES**

NICKEL PEELINGS
PURE NICKEL SCRAP
NICKEL DUST
MONEL METAL
MONEL TURNINGS
WHITE METAL DROSSES

**INDUSTRIAL METAL CO.**
1373-77 FRANKFORD AVE. PHILADEPHIA, PA.

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RARE METALS AND MINERALS BOUGHT AND SOLD FOR CASH

Platinum, Osmiridium, Palladium, Silver, Quicksilver, Amalgams, Bismuth, Osmium, Rhodium, Ruthenium, Mercury Lamps, Tungsten, Molybdenum, Etc.

**JOSEF RADNAI**
36 FULTON ST. NEW YORK

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**WE ARE BUYERS OF**

NICKEL ANODE SCRAP, NICKEL STRIPPINGS and PEELINGS, NICKEL DROSSES, NICKEL SHEET CLIPPINGS, NICKEL TURNINGS, NICKEL BASKETS, HANGERS and RACKS, (Brass, Copper, Iron Base)

*Send Us Your Offerings*

**BATTAGLIA BROS.**
298 WATER STREET NEW YORK, N. Y.

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This Card Will Tell Every Metal Consumer

in the Land

That You Buy and Sell Metals

## Directory of Contract Workers

### CASTING, SPINNING, DESIGNING, MOLD MAKING, PLATING SPECIALTIES, ETC.

**WM. BERGFELS & CO.**
391 & 393 MULBERRY ST. NEWARK, N. J.
**Spinning in all metals. Oval work a specialty**
Tel. Market 8923

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**HAVE YOU ANYTHING TO GRIND?**
We are specialists in Surface, Concave, Edge and Machine grinding of every description. Square shears, blades and milling cutters especially.

**WM. LANGBEIN & BROS.**
61 Centre St., New York City
Flatbush Ave. Extension and Willoughby St., B'klyn, N. Y.
"EVERYTHING SHARPENED THAT NEEDS AN EDGE"
Dependable workmanship always.

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For information concerning this space, write to
THE METAL INDUSTRY
99 John St. New York City

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**A CARD IN THIS DIRECTORY WILL BENEFIT YOUR BUSINESS**

# BUSINESS WANTS

## FOR SALE—EQUIPMENT, ETC.

**Display Advertisements, One Column Wide, $3 per inch, Each Insertion.**

**REBUILT AND GUARANTEED**

### Electro-Platers - Buffers - Ammeters

**at 40% to 50% less than new cost**

Fuerst-Friedman rebuilt plating generators and buffers are in daily use in all parts of North America. For 27 years we have specialized in the rebuilding of this class of machinery. Every plater is thoroly tested under full load before shipment and is equal in practical performance to new. The following machines are now ready for immediate shipment. If what you need is not listed, consult us first.

| Amp. | Volts | Speed | Make |
|---|---|---|---|
| 25 | 6 | 900 | Fairbanks-Morse |
| 75 | 6 | 1600 | Hanson & Van Winkle |
| 125 | 20/30 | 1120 | Western Electric |
| 200 | 6 | 900 | Lincoln |
| 200 | 6 | 680 | Bennett-O'Connell |
| 250 | 6 | 1500 | Bennett-O'Connell |
| 400 | 45 | 1000 | Roth |
| 800 | 7 | 800 | Reliance |
| 1000 | 6 | 1120 | Ideal |
| 1000/500 | 6/12 | 1200 | Stevens |
| 1500/750 | 6/12 | 1100 | Hanson & Van Winkle |
| 2500/1250 | 6/12 | 525 | Connecticut |
| 6000/3000 | 6/12 | 430 | Munning Optimus |

With direct connected motor, 3 phase, 60 cycle.

**D. C. AMMETERS**

1—25000 amp. General Electric Astatic type with shunt.
5— 6000 amp. General Electric Astatic type with shunt.
1— 5000 amp. General Electric Astatic type with shunt.
2— 4000 amp. General Electric new Astatic type with shunt.
2— 3000 amp. Weston model 414 with shunt.
2— 2500 amp. Weston model 57 with shunt.
6— 2000 amp. Westinghouse style 8486 with shunt.
5— 1500 amp. General Electric Astatic type with shunt.
1— 1000 amp. General Electric Astatic type with shunt.
2— 800 amp. Weston model 57 with shunt.
1— 750 amp. Weston with shunt.
1— 600 amp. Weston with shunt.
26—500-0-500 amp. Gen. Elec. new Astatic type with shunt.
8—400-0-400 amp. Gen. Elec. new Astatic type with 300 amp. shunt.

**BUFFERS**

2—1 HP, 110 volt, D. C. U. S. Electric Tool, type KKB, 2400 RPM Bench Buffer.
1—2 HP, 110 volt, D. C. U. S. Electric Tool, type KMB, 2050 RPM pedestal Buffer.
1—2 HP, 550 volt (can be reconnected to other voltage), 3 phase, 60 cycle, U. S. Electric Tool, 1800 RPM Buffer.
1—5 HP, 220 volt D. C. Dillon 3600 RPM pedestal Buffer.

**THE FUERST-FRIEDMAN CO.**
**1295 E. 53rd St. Cleveland, Ohio**

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# Complete Plating and Polishing Plant For Sale

**[Very Attractive Price]**

◆

**F. N. DU BOIS CO.**
**152 RIVERSIDE AVE. ~ NEWARK, N. J.**

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# FOR SALE 20 ACRES

1350 feet on Mississippi River. Tract served by Missouri Pacific Railroad and Mississippi Barge Line. Ideal for manufacturer receiving and shipping by rail or water.

**MERCANTILE TRUST COMPANY, Agent**
***Specialists in Industrial Sites***
**Eighth & Locust Sts. St. Louis, Mo.**

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## Polishing and Plating Equipment

**Plating Dynamos and Motor Generator Sets**
All sizes carried in stock.
Tumbling and Plating Barrels.

| | | | |
|---|---|---|---|
| Anodes | Wheels and Buffs | Steam Boilers | Kane and Ofeldt |
| Spraying Systems | Ammeters | | |
| Polishing Lathes | Rheostats | Gas Fired | |
| Plating Tanks | Voltmeters | Blower Systems | |

And most anything for the Plating Shop.

J. HOLLAND & SONS, INC.
489 Broadway, Brooklyn, N. Y.
Telephone Stagg 5128.

**Largest Stock of Used Polishing and Plating Supplies in America**
Let us have your requirements. Entire plants or parts thereof bought for cash. Send list with prices.

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## PLATING EQUIPMENT

FOR SALE—New Electro-Plating Cylinders. Good for 300 to 1,200 hours' service. Any size to meet your requirements. 14" Diameter x 24" Long, at $15.75 F. O. B. Shipping Point. Other prices in proportion. Proven by 33 months of constant usage. Particulars cheerfully given.

C. G.
Care THE METAL INDUSTRY.

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## JOB PLATING SHOP

For Sale—Old established job plating shop doing a splendid business. No competition. Inquire.

FARGO PLATING CO
Fargo, No. Dak.

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A card in this directory will sell your surplus equipment.

# BUSINESS WANTS—Continued

## FOR SALE—EQUIPMENT, ETC.—Continued

**Display Advertisements, One Column Wide, $3 per inch, Each Insertion**

### Conveyor Plating Tanks

FOR SALE: 3—14′ x 30″ x 30″ Hanson & Van Winkle Co. semi-automatic conveyor plating tanks, in excellent condition. Two were used for nickel and the other, lead lined, used for silver. Priced right for quick sale.

BOSTON PLATING SUPPLY CO., INC.,
101 Haverhill Street, Boston, Mass.

### Plating Equipment

FOR SALE: 1—300 ampere 6 volt OPTIMUS, late type, plating dynamo. 1—4 h.p. Van Dorn Polishing Lathe, 1800 r.p.m., 220 V. 60 cycle, 3 phase. A number of 0-10 Voltmeters, 0-200 Ammeters, and Crown Rheostats. All sizes of dynamos up to 1500 amperes.

BOSTON PLATING SUPPLY CO., INC.,
101 Haverhill Street, Boston, Mass.

### Burnishing Barrels

FOR SALE: 1—Baird Double No. 1 Barrel.
2—Baird Single No. 1 Barrels.
1—Abbot Barrel, 30″ x 16″.
4—Abbot Barrels, 30″ x 8″.

BOSTON PLATING SUPPLY CO., INC.,
101 Haverhill Street, Boston, Mass.

When you need an equipment consult this directory

## WANTED—EQUIPMENT, ETC.

**Display Advertisements, One Column Wide, $3 per inch, Each Insertion.**

### We Want a New Product

There are many men in the polishing and plating trades that have some good sound practical ideas or formulas. Something that would bring them an additional income.

We are not looking for a large equipment to manufacture but are interested in obtaining a formula, an idea, or possibly something of a chemical nature that can be sold to the polishing and plating trade. If you have that something and believe it would interest us, no matter how small or large the field for it may be, let's get together and talk it over.

Our business is specialties for the polishing and plating trade.

Your dealings with us will be strictly confidential.

P. O. BOX 405 WATERBURY, CONN.

## INQUIRIES AND OPPORTUNITIES

**For further particulars address THE METAL INDUSTRY, 99 John Street, New York City.**

Inquiry No. 3539—Where can we have small pieces of aluminum plated?

Inquiry No. 3540—Who manufactures Cadmium Plating Outfits?

Inquiry No. 3541—Can you give us information as to how we should cast a special bronze brush containing graphite for dynamos?

Inquiry No. 3542—We are in the market for a new Plating Dynamo of about 4000 Ampere capacity, 7½ Volt direct connected to a Motor suitable for 220 Volt, 60 cycle, 3 phase alternating current.

Inquiry No. 3543—Can you advise us who makes automatic polishing machines?

Inquiry No. 3544—Could you advise us where we could obtain a small insulator for teapot use, ⅜″ diameter?

Inquiry No. 3545—Wanted, the names of makers of machinery and presses for the production of collapsible tubes in tin, lead and aluminum.

## SITUATIONS OPEN

**Display Advertisements, One Column Wide, $3 per inch, Each Insertion.**

### Sales Engineer

SITUATION OPEN—Man to sell our Pyro-Lance to the foundry trade. This popular pyrometer will be a profitable addition for those who now regularly call on this trade. Write for details; also describe your contact.

ILLINOIS TESTING LABORATORIES, INC.,
145 W. Austin Avenue., Chicago, Ill.

### HELP WANTED

SALESMAN—Man who has confidence in his abilities and will finance himself to sell polishing compositions in Detroit, Michigan and vicinity. Old manufacturer who makes uniform products. Liberal commission. Apply by letter to Box C—Metal Industry.

# BUSINESS WANTS—Continued

## SITUATIONS OPEN—Continued

**Display Advertisements, One Column Wide, $3 per inch, Each Insertion.**

### SALESMAN

SITUATION OPEN—Salesman, preferably one who has been calling on Lacquer, Cleaner or Buffing Composition trade in New England. In reply state past employers and product, territory covered, age and salary desired.

DECEMBER 1,
Care THE METAL INDUSTRY.

### FOUNDRY FOREMAN

SITUATION OPEN—Aluminum and brass foreman. Thoroughly experienced in production methods and non-ferrous foundry practice. Give detailed experience in first letter. Excellent opportunity for advancement.

ALUMINUM
Care THE METAL INDUSTRY.

### BRASS PIPE EXPERT

SITUATION OPEN—A large New Jersey concern has a position open for an experienced man who can install and set up and take charge of a brass pipe fitting testing department. A very good opportunity for right man.

N. J.
Care THE METAL INDUSTRY.

### ASSISTANT FOREMAN

SITUATION OPEN: Assistant foreman for polishing and plating department. State age and give outline of experience. Located in Connecticut.

Assistant
Care of METAL INDUSTRY

### Copper Metallurgist

SITUATION OPEN—Would like to communicate with party having knowledge of the separation of nickel and copper from nickel alloys. Reply

COPPER NICKEL
Care THE METAL INDUSTRY

**If you are looking for a good man to fill an important job, you will find one by using this space.**

## SITUATIONS WANTED

**Display Advertisements, One Column Wide, $1 per inch, Each Insertion.**

### MANUFACTURING EXECUTIVE

Situation Wanted—Superintendent; works manager; production manager or assistant to president. Age forty-two, practical mechanic. Cost analysis, and reduction, development of new lines or organization. Twenty years' experience pressed and drawn brass and steel goods including electrical specialties; plumbers' brass goods; screw machine products; castings and hot die pressings. A-1 references.

EXECUTIVE
Care of METAL INDUSTRY

### Buffing and Polishing Compositions

Expert of 20 years' experience, former manufacturer, will furnish working formulas guaranteed to produce better goods than the average and install equipment.

COMPOSITION
Care THE METAL INDUSTRY

### Brass Superintendent

SITUATION WANTED—Brass Superintendent thoroughly familiar with design, patterns, foundry machine and tool work for the manufacture of plumbing steam gas and water brass goods is desirous of making a connection as Superintendent or Manager. Qualified to develop an organization and perfect the manufacture of brass goods. Address: DECEMBER 2,
Care THE METAL INDUSTRY.

### Foundry Foreman

SITUATION WANTED—By Brass Foundry Foreman; practical molder on false core and ornamental French sand castings. Address

FRENCH SAND MOLDER,
Care THE METAL INDUSTRY.

### PLATER

SITUATION WANTED—Electro-Plater at present employed as factory superintendent, 28 years' experience in all branches Plating, Polishing, Lacquering, etc., having silver plating of heavy deposits and metalizing non-metallic surfaces. Desires to make a change. Best of reference.

L. G.,
Care THE METAL INDUSTRY.

### WORKING PLATER

SITUATION WANTED—Has 11 years' experience in plating chandeliers and fixtures, Sheffield-ware and hotel-ware. I can plate anything on metal and make all finishes that are required. Can furnish the best references. I would like to get in touch with a small reliable concern in Brooklyn or New York. My salary is $45.00.

M. ROTER,
633 Vermont Street, Brooklyn, N. Y.

### Electro Platers

Any one desiring the services of first class men for the electrodeposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the American Electro Platers' Society.

GEORGE GEHLING,
5001 Edmund Street, Philadelphia.

### Foreman Plater

SITUATION WANTED—By man with 18 years' experience as foreman of Plating, Polishing and Lacquering Departments. Familiar with all solutions and finishes, including chromium. Good production man. Wishes to make change.

C. F. O.
Care THE METAL INDUSTRY.

# BUYERS' GUIDE: ADVERTISERS' PRODUCTS

**(Advertisers are entitled to one listing for each sixteenth page of space)**

ABRASIVES (Also see Emery)

Alundum

Norton Co., Worcester, Mass.

Artificial

Abrasive Company, Bridesburg, Philadelphia, Pa.
General Abrasive Co., Niagara Falls, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
Zucker Sons Co., Inc., Elizabeth, N. J.

Emery

Keystone Emery Mills, Philadelphia, Pa.
Stevens Co., Inc., Frederic B., Detroit, Mich.

ACCUMULATORS, HYDRAULIC (Also see Hydraulic Machinery.)

Watson-Stillman Co., New York.

ACID PIPE

Belke Mfg. Co., Chicago, Ill.

ACID

Resistance, Hard Rubber

American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.

ACIDS

Chromic

Cooper, Chas., & Co., New York.

Hydrofluoric

General Chemical Co., Philadelphia, Pa.

Oil of Vitriol (Sulphuric)

E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Hegeler Zinc Co., Danville, Ill.
Zapon Co., The, New York, N. Y.

AEROPLANE DOPE

E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
G. J. Nikolos & Co., Chicago, Ill.
Zapon Co., The, New York, N. Y.

Mechanical

Belke Mfg. Co., Chicago, Ill.

AGITATORS FOR PLATING SOLUTIONS

Belke Mfg. Co., Chicago, Ill.

Mechanical

Belke Mfg. Co., Chicago, Ill.

AIR BRUSHES, COMPRESSORS AND ACCESSORIES (See Sprayers; Spraying Accessories)

DeVilbiss Mfg. Co., Toledo, O.
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.
Ideal Air Brush Mfg. Co., New York.

AIR FILTERS

DeVilbiss Mfg. Co., Toledo, O.
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.

ALLOYS (See also Kind Wanted)

Non-Ferrous

American Brass Co., Waterbury, Conn.
Duriron Co., The, Dayton, Ohio.
International Nickel Co. (Inc.), The, New York.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Brass, Bronze, Nickel Silver

American Brass Co., Waterbury, Conn.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

ALUMINUM (See Ingots, Sheets, Wire, Rod etc.)

Angles and Channels

Aluminum Company of America, Pittsburgh, Pa.

Sheet

Sheet Aluminum Co., Jackson, Mich.

ALUMINUM ALLOYS

Aluminum Company of America, Pittsburgh, Pa.

Alundum

Norton Co., Worcester, Mass.

AMMETERS (See also Electrical Apparatus and Equipment)

Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.

AMYL ACETATE

E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., New York.
Zapon Co., The, New York, N. Y.

ANNEALING FURNACES

Electric

Oil or Gas

Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell, W. S., Company, New York.
Surface Combustion Co., The, Toledo, Ohio.

ANODES

All Metals

Hanson-Van Winkle-Munning Co., Newark, N. J.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
The Lustre Co., Inc., St. Louis, Mo.
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.

Brass and Bronze

Anode Corp. of America, New York.
Apothecaries Hall Co., Waterbury, Conn.
Daniels & Orben Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Lasalco, Inc., St. Louis, Mo.
MacDermid Incorporated, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.

Cadmium

Fuhrman & Lundberg, Chicago, Ill.
Grasselli Chemical Co., Cleveland, Ohio.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Udylite Process Co., Kokomo, Ind.

Copper

American Brass Company, Waterbury, Conn.
Anode Corp. of America, New York.
Apothecaries Hall Co., Waterbury, Conn.
Daniels & Orben Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Hussey, C. G., & Co., Pittsburgh, Pa.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
MacDermid Incorporated, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.

Gold

Anode Corp. of America, New York.
Handy & Harman, New York.

Lead

Industrial Filter & Pump Mfg. Co., Chicago, Ill.

Nickel

Anode Corp. of America, New York.
Apothecaries Hall Co., Waterbury, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Lasalco, Inc., St. Louis, Mo.
MacDermid Incorporated, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Stevens, F. B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.

Platinum

Handy & Harman, New York.
Jackson, John J., Co., Newark, N. J.
Roessler & Hasslacher Chemical Co., New York.

Tin

Industrial Filter & Pump Mfg. Co., Chicago, Ill.

Zinc

Anode Corp. of America, New York.
Apothecaries Hall Co., Waterbury, Conn.
Grasselli Company, The, Cleveland, Ohio.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Meaker, The, Co., Chicago, Ill.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.

ANTI-FRICTION METAL (See also Babbitt Metal and Bearings.)

Ajax Metal Co., Philadelphia, Pa.

ASSAY CRUCIBLES, Sand

Jonathan Bartley Crucible Co., Trenton, N. J.
Joseph Dixon Crucible Company, Jersey City, N. J.
Plumbago Crucible Association, The, New York.

ASSAYERS AND CHEMISTS (See also Testing Laboratories.)

Pitkin, Lucius, Inc., New York.

AUTOMATIC POLISHING MACHINES

Acme Mfg. Co., Detroit, Mich.

AUTOMATIC WIRE AND SHEET METAL WORKING MACHINERY

Baird Machine Co., Bridgeport, Conn.

BABBITT METAL (See also Bearings.)

Ajax Metal Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.

BABBITT MOLDS (See Molds.)

BALL BURNISHING EQUIPMENT (Also see Burnishing and Polishing Barrels.)

Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, Ohio.
Hartford Steel Ball Co., The, Hartford, Conn.

BALLS & SPECIAL SHAPES—STEEL

Abbott Ball Co., Hartford, Conn.
Beaver, H. Leroy, Co., Philadelphia, Pa.
Hartford Steel Ball Co., The, Hartford, Conn.

BARS; SILVER, GOLD, PLATINUM

Handy & Harman, New York.

BASKETS DIPPING

Smith & Co., John P., New Haven, Conn.

BEARINGS (Also see Babbitt Metal and Anti-Friction Metal.)

Babbitt

Ajax Metal Co., Philadelphia, Pa.

BLAST FORGES

Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Miner & Peck Mfg. Co., Derby, Conn.

BLAST GATES

Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Miner & Peck Mfg. Co., Derby, Conn.

BLOWERS AND BLOW PIPING (See also Exhaust Fans and Heads.)

Astle, H. J., & Co., Providence, R. I.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Monarch Engineering & Mfg. Co., Baltimore, Md.

BLOWERS, HIGH PRESSURE

Leiman Bros., New York.

BOILER INSULATION (See Brick, Insulating; Insulating Cement.)

BOILERS, SETTING (See Fire Cement.)

BOILERS, WATER TUBE

Babcock & Wilcox Co., New York.

BRASS (See Brass Mill Products; Wire Mill Products; Anodes; Castings; Die Castings; Forgings; Ingots; Rods and Bars; Sheets; Strip Metal; Tubes; Wire.)

BRASS FOUNDERS (See Castings.)

BRASS FOUNDRY EQUIPMENT & SUPPLIES (See Kind Wanted.)

BRASS MILL ENGINEERS (See Engineers.)

BRASS MILL MACHINERY (Also See Kind Wanted.)

Mackintosh-Hemphill Co., Pittsburgh, Pa.

BRASS MILL PRODUCTS

American Brass Co., Waterbury, Conn.
Baltimore Brass Co., Baltimore, Md.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

BRASS ROLLING MILL MACHINERY

Torrington Mfg. Co., Torrington, Conn.

BRASS; SHEET, WIRE, ROD, TUBE (Also see Wire Mill Products; Rods and Bars; Sheets; Strip Metals; Tubes; Wire, Etc.)

American Brass Company, Waterbury, Conn.
Bristol Brass Co., Bristol, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Dallas Brass & Copper Co., Chicago, Ill.
Hendricks Bros., New York.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Taunton-New Bedford Copper Co., Taunton, Mass.
Western Cartridge Co., Alton, Ill.
Waterbury Rolling Mills, Waterbury, Conn.

BRASS WORKING LATHES (See Lathes.)

BRICK

Cork Paving

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Insulating

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

# BUYERS' GUIDE: ADVERTISERS' PRODUCTS

**(Advertisers are entitled to one listing for each sixteenth page of space)**

**BRONZE** (See also Anodes; Castings; Forgings; Ingots; Powdered; Rods and Bars; Tubes, Etc.)
Western Cartridge Co., Alton, Ill.

Bearing
**American Brass Co., Waterbury, Conn.**

Phosphor, Tobin, Manganese
**American Brass Co., Waterbury, Conn.**
**Conklin, T. B., Brass & Copper Co., New York.**
**Scovill Mfg. Co., Waterbury, Conn.**

**BRONZING LIQUID**
**Anderson Chemical Co., New York.**
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
**Egyptian Lacquer Mfg. Co., New York.**
G. J. Nikolos & Co., Chicago, Ill.
**Waukegan Chemical Co., Waukegan, Ill.**
**Zapon, The, Co., New York.**
**Zeller Lacquer Mfg. Co., New York.**

**BRUSHES**
Hand
**Blumenthal, H., & Co., New York.**
Hanson-Van Winkle-Munning Co., Newark, N. J.
G. J. Nikolos & Co., Chicago, Ill.

Wheel
**Blumenthal, H., & Co., New York.**
Boissier Elec. Corp., New York, N. Y.
**Hanson & Van Winkle Co., Newark, N. J.**

**BUFFING AND POLISHING COMPOSITION**
**Apothecaries Hall Co., Waterbury, Conn.**
Boissier Elec. Corp., New York, N. Y.
**Buchanan, Thos., Co., Cincinnati, Ohio.**
**Burns & Sons, Inc., E. Reed, Brooklyn, N. Y.**
**Crown Rheostat & Supply Co., Chicago, Ill.**
**Daniels & Orben Co., Inc., New York.**
Hanson-Van Winkle-Munning Co., Newark, N. J.
**Lasalco, Inc., St. Louis, Mo.**
**Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.**
**Oden Corp., College Point, L. I., N. Y.**
Stevens, Inc., Frederic B., Detroit, Mich.
**Stutz, Geo. A., Mfg. Co., Chicago, Ill.**
**Zucker Sons Co., Inc., Elizabeth, N. J.**

**BUFFING AND POLISHING MACHINES** (See Polishing and Buffing Machines)

**BUFFING MACHINES AUTOMATIC** (Also see Polishing Lathes and Heads.)
**Divine Bros. Co., Utica, N. Y.**

**BUFFING AND POLISHING WHEELS** (Also See Buffs.)
Canvas, Cotton, Etc.
**Advance Wheel Mfg. Co., Chicago, Ill.**
**Buchanan, Thos., Co., Cincinnati, Ohio.**
**Codman, F. L. & J. C., Co., So. Boston, Mass.**
**Crown Rheostat & Supply Co., Chicago, Ill.**
**Daniels & Orben Co., Inc., New York.**
**Divine Bros. Co., Utica, N. Y.**
**Eastern Felt Co., Winchester, Mass.**
**Guaranteed Buff Co., Brooklyn, N. Y.**
Hanson-Van Winkle-Munning Co., Newark, N. J.
**Indiana Buff Co., South Bend, Ind.**
**Lasalco, Inc., St. Louis, Mo.**
**Lea Mfg. Co., The, Waterbury, Conn.**
**L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.**

Felt
Codman, F. L. & J. C., Co., So. Boston, Mass.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Newark, N. J.
**Pressed Leather Wheel Co., Little Falls, N. Y.**

Leather
Divine Bros. Co., Utica, N. Y.

Sheepskin
Codman, F. L. & J. C., Co., So. Boston, Mass.

**BUFFS** (Also see Buffing and Polishing Wheels.)
**Buchanan, Thos., Co., Cincinnati, Ohio.**
**Burns & Sons, Inc., E. Reed, Brooklyn, N. Y.**
**Codman, F. L. & J. C., Co., So. Boston, Mass.**
**Crown Rheostat & Supply Co., Chicago, Ill.**
**Divine Bros. Co., Utica, N. Y.**
**Guaranteed Buff Co., Brooklyn, N. Y.**
**Hanson-Van Winkle-Munning Co., Newark, N. J.**
**Indiana Buff Co., South Bend, Ind.**
**Lasalco, Inc., St. Louis, Mo.**
**MacDermid Incorporated, Waterbury, Conn.**
**Oden Corp., College Point, L. I., N. Y.**
**Pressed Leather Wheel Co., Little Falls, N. Y.**
**Stutz, Geo. A., Mfg. Co., Chicago, Ill.**

**BUILDING PAINT SPRAYERS**
**DeVilbiss Mfg. Co., Toledo, O.**

**BURNERS** (Also see Furnaces.)
Air and Gas Pre-Mixing
**Campbell-Hausfeld Co., Harrison, Ohio.**
**Monarch Engineering & Mfg. Co., Baltimore, Md.**
Surface Combustion Co., The, Toledo, Ohio.

Air and Gas Pre-Mixing
**Campbell-Hausfeld Co., Harrison, Ohio.**
Surface Combustion Co., The, Toledo, Ohio.

Oil or Gas
**Campbell-Hausfeld Co., Harrison, Ohio.**
**Johnson Gas Appliance Co., Cedar Rapids, Ia.**
Surface Combustion Co., The, Toledo, Ohio.

**BURNISHING AND POLISHING BARRELS**
**Abbott Ball Co., Hartford, Conn.**
**Baird Machine Co., Bridgeport, Conn.**
**Crown Rheostat & Supply Co., Chicago, Ill.**
**Globe Machine & Stamping Co., Cleveland, Ohio.**
**Henderson Bros. Co., Waterbury, Conn.**
Lupomatic Tumbling Machine Co., New York.
**Smith-Richardson Co., Attleboro, Mass.**

**BURNISHING COMPOUNDS AND CHIPS** (Also see Soap.)
**Abbott Ball Co., Hartford, Conn.**
**Beaver, H. Leroy, Co., Philadelphia, Pa.**
**Hartford Steel Ball Co., The, Hartford, Conn.**
**International Chemical Co., Philadelphia, Pa.**
Lupomatic Tumbling Machine Co., New York.

**CABLING MACHINERY**
**Torrington Mfg. Co., Torrington, Conn.**

**CADMIUM PLATING**
**Grasselli Chemical Co., Cleveland, Ohio.**
**Pyrene Mfg. Co., Newark, N. J.**

**CANVAS WHEELS** (See Buffing and Polishing Wheels.)

**CASTINGS**
Acid Proof
**The Duriron Co., Dayton, Ohio.**
The International Nickel Co. (Inc.), New York, N. Y.

Aluminum
**Aluminum Company of America, Pittsburgh, Pa.**

Brass, Bronze and Composition
**Ajax Metal Co., Philadelphia, Pa.**

**CAUSTIC SODA**
**Buchanan, The Thos., Co., Cincinnati, Ohio.**
**International Chemical Co., Philadelphia, Pa.**
**Roessler & Hasslacher Chemical Co., New York.**

**CEMENT** (See Fire Cement; Insulating Cement.)

**CEMENT**
Furnace
**Campbell-Hausfeld Co., Harrison, Ohio.**

**CENTRIFUGAL DRYERS AND EXTRACTORS** (Also see Drying-Out Machines.)
**Tolhurst Machine Works, Troy, N. Y.**

**CHAIN GRATE STOKERS**
**Babcock & Wilcox Co., New York.**

**CHEMICALS, DEALERS IN ALL KINDS** (Also see Kind Wanted.)
Platers
**Chas. Cooper & Co., New York.**
**The Lustre Co., Inc., St. Louis, Mo.**
**Roessler & Hasslacher Chemical Co., New York, N. Y.**

**PLATERS AND GALVANIZERS**
**U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.**

**CHEMISTS, CONSULTING** (See Assayers and Chemists; Testing Laboratories.)

**CHLORIDE OF COPPER**
**Chas. Cooper & Co., New York.**

Nickel
**Chas. Cooper & Co., New York.**

**CHROMIUM**
**Chromium Corp. of America, New York.**
**Metal & Thermit Corp., New York.**
National Chromium Corp., New York, N. Y.
United Chromium Inc., Detroit, Mich.

**CHROMIUM PLATING**
Chromium Machine Co., Inc., Sag Harbor, L. I.
**Chromium Corp. of America, New York.**
National Chromium Corp., New York, N. Y.
**New Haven Sherardizing Co., The., Hartford, Conn.**
United Chromium Inc., Detroit, Mich.

**CHROMIUM MACHINERY**
Chromium Machine Co., Inc., Sag Harbor, L. I.

**CHROMIUM PLATING POLISH**
Boissier Elec. Corp., New York, N. Y.
Hanson-Van Winkle-Munning Co., Newark, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
**Zucker Sons Co., Inc., Elizabeth, N. J.**

**CHUCKING MACHINES, AUTOMATIC**
**Baird Machine Co., Bridgeport, Conn.**

**CHUCKS**
Oval
**Pryibil, P., Machine Co., New York.**

Spinning
**Pryibil, P., Machine Co., New York.**

**CINDER CRUSHERS** (See Crushers and

**CLEANERS, METAL, WASTE, GENERAL**
**Cowles Detergent Co., Cleveland, Ohio.**
**Ford, J. B., Co., Wyandotte, Mich.**
**Fuller, W. A., Co., Greensburg, Pa.**
**International Chemical Co., Philadelphia, Pa.**
**MacDermid Incorporated, Waterbury, Conn.**
**Magnus Chemical Co., Brooklyn, N. Y.**
**Magnuson Products Corp., Brooklyn, N. Y.**
**Oakite Products, Inc., New York, N. Y.**
**Sulphur Products Co., Greensburg, Pa.**

**CLEANING APPARATUS, AUTOMATIC METAL** (Also see Pickling Machines.)

**CLEANING COMPOUNDS** (See also Fig Cleaner; Pickling Compounds, Whale Oil Soaps.)
Metal
**Anthony, H. M., Co., New York.**
**Apothecaries Hall Co., Waterbury, Conn.**
**Cowles Detergent Co., Cleveland, Ohio.**
**Ford, J. B., Co., Wyandotte, Mich.**
**Fuller, W. A., Co., Greensburg, Pa.**
Hanson-Van Winkle-Munning Co., Newark, N. J.
**International Chemical Co., Philadelphia, Pa.**
Lasalco Inc., St. Louis, Mo.
The Lustre Co., Inc., St. Louis, Mo.
**MacDermid, Inc., Waterbury, Conn.**
**Magnus Chemical Co., Brooklyn, N. Y.**
**Magnuson Products Corp., Brooklyn, N. Y.**
**Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.**
**Oakite Products, Inc., New York, N. Y.**
**Stevens, Inc., Frederic B., Detroit, Mich.**
**Sulphur Products Co., Greensburg, Pa.**

**CLEANING SYSTEMS**
(Vaccum)
Allington & Curtis Co., Saginaw, Mich.

**COCK GRINDERS**
Automatic
**Turner Foundry & Machine Co., Philadelphia, Pa.**

**COCKS**
Acid Proof
**Duriron, The, Co., Inc., Dayton, Ohio.**

**COLLECTING SYSTEMS** (Dust, Shavings, Sawdust, Dust Metal.)
Allington & Curtis Co., Saginaw, Mich.

**COMMUTATORS**
**Belke Mfg. Co., Chicago, Ill.**

**COMPOSITION METAL** (See Castings; Ingot, Etc.)
Greaseless, for Metal Finishing
**Lea Mfg. Co., The, Waterbury, Conn.**

**COMPOSITIONS** (See Buffing and Polishing Composition; Flooring Composition.)
Hanson-Van Winkle-Munning Co., Newark, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.

**COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING**
**International Chemical Co., Philadelphia, Pa.**
**Magnuson Products Corp., Brooklyn, N. Y.**
**Oakite Products, Inc., New York, N. Y.**

**COMPRESSORS, AIR & GAS** (See Air Compressors.)

**CONCENTRATING TABLES** (See also Reclaiming Machinery.)
**Hardinge Company, New York.**

# BUYERS' GUIDE: ADVERTISERS' PRODUCTS

**(Advertisers are entitled to one listing for each sixteenth page of space)**

CONVEYING SYSTEMS (Pneumatic Light Materials.)
Allington & Curtis Co., Saginaw, Mich.

COPPER (Also see Anodes; Castings; Ingots, Rods and Bars; Sheets; Smelters and Refiners; Strip Metal; Tubes; Wire, Etc.)
Sheet, Wire, Rod, Tube
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.

COPPER BEARING MATERIAL, BUYERS OF (See Drosses, Residues, Etc.)

COPPER BORONIC
American Boron Products Co., Buffalo, N. Y.

COPPER, CARBONATE OF
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben Co., Inc., New York.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Roessler & Hasslacher Chemical Co., New York, N. Y.

COPPER-CYANIDE
American Cyanamid Co., New York.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Zapon Co., The, New York, N. Y.

CORE MACHINES
Stevens, Inc., Frederic B., Detroit, Mich.

CORE OIL AND COMPOUNDS
Stevens, Inc., Frederic B., Detroit, Mich.

CORE OVEN INSULATION (See Brick Insulating; Insulating Cement; Insulating Oven.

CORE OVENS
Coal and Coke
Monarch Engineering & Mfg. Co., Baltimore.
E. E. Steiner & Co., Newark, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Oil and Gas
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Inc., Frederic B., Detroit, Mich.

COUPLES
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

CRUCIBLES, METAL MELTING
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co. of Pittsburgh, Pittsburgh, Pa.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Naugatuck Valley Crucible Co., Shelton, Conn.
Plumbago Crucible Association, The, New York.
Ross Tacony Crucible Co., Tacony, Philadelphia, Pa.
Stevens, Inc., Frederic B., Detroit, Mich.
Alundum
Norton Co., Worcester, Mass.

CRUSHERS AND PULVERIZERS (See also Reclaiming Machinery.)
Eastern Machinery Co., New Haven, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Hardinge Company, New York.
Standard Equipment Co., New Haven, Conn.

CUPRO-NICKEL (See Brass Mill Products.)

CUTTING, STRAIGHTENING & FORMING MACHINERY
Wire
Baird Machine Co., Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Strip Metal
American Cyanamid Co., New York.
Baird Machine Co., Bridgeport, Conn.
Buchanan, Thos., Co., Cincinnati, Ohio.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.

DEOXIDIZERS, METAL (See Fluxes)

DIE CASTINGS
Aluminum
Aluminum Company of America, Pittsburgh, Pa.

DIE CASTING MACHINES
Soft Metal
Byrd, R. E., Erie, Pa.

DIPPING BASKETS
Dipping and Plating
American Hard Rubber Co., New York.
General Ceramics Co., New York.
Smith, John P., Co., New Haven, Conn.
Stoneware
General Ceramics Co., New York.

DRAW BENCHES
Wire, Rod, Tube
Farrel Foundry & Machine Co., Ansonia, Conn.
Watson-Stillman Co., New York.
Light Wire
Leiman Bros., New York.

DRAWING AND STAMPING (See Metal Goods Made to Order; Stamping and Drawing.)

DRILLING MACHINES
Light Sensitive
Leiman Bros., New York.

DRINKING WATER SUPPLY SYSTEMS
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

DROP LIFTERS (See also Presses, Drop Lifters for.)
Automatic
Miner & Peck Mfg. Co., Derby, Conn.

DROSSES, RESIDUES, ETC., BUYERS OF (Also see Metal Dealers, Old.)

DRYERS (See Centrifugal Dryers; Ovens; Drying-Out Machines; Ladle Heaters and Dryers; Mold Dryers; and Dryers; Sawdust Drying-Out Boxes.)

DRYING-OUT MACHINES (See also Centrifugal Dryers and Extractors; Sawdust Drying-Out Boxes.)
Baird Machine Co., Bridgeport, Conn.
Smith-Richardson Co., Attleboro, Mass.
Automatic
Astle, H. J., & Co., Providence, R. I.
Tolhurst Machine Works, Troy, N. Y.

DUST COLLECTORS AND VENTILATING SYSTEMS (Also see Exhaust Fans and Heads.)
Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Pangborn Corp., Hagerstown, Md.

DYNAMOS, LOW VOLTAGE, PLATING AND GALVANIZING (Also see Electrical Apparatus and Equipment.)
Bogue, Chas. J., Electric Co., New York.
Boissier Elec. Corp., New York, N. Y.
Chandeysson Electric Co., St. Louis, Mo.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Electric Products Co., The, Cleveland, O.
Hanson-Van Winkle-Munning Co., Newark, N. J.
Ideal Electric & Mfg. Co., Mansfield, Ohio.
Jantz & Leist Electric Co., Cincinnati, Ohio.
Meaker, The, Co., Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

DYNAMOS, PLATING, USED
Fuerst-Friedman Co., Cleveland, Ohio.
J. Holland Sons, Brooklyn, N. Y.

ELECTRIC CRANES (See Cranes.)

ELECTRIC FURNACES
Melting
Ajax Metal Co., Philadelphia, Pa.
Refractories
Bartley, Jonathan, Crucible Co., Trenton, N. J.

ELECTRIC OVENS (See Ovens; also Core Ovens.)

ELECTRICAL APPARATUS AND EQUIPMENT (Also see Ammeters, Rheostats, Switchboards, Transformers, Voltmeters.)
Bogue, Chas. J., Electric Co., New York.

ELECTRICAL CONDUCTORS
Aluminum
Aluminum Company of America, Pittsburgh, Pa.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO GALVANIZING EQUIPMENT AND SUPPLIES (See Dynamos; Plating Barrels; Plating Machines, Automatic; Tanks, Etc.)
Meaker, The, Co., Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO-GALVANIZING, JOB AND CONTRACT
Hassall, John, Inc., Brooklyn, N. Y.
Meaker, The, Co., Chicago, Ill.
Mercil Plating Equipment Co., Chicago, Ill.

ELECTRO PLATING EQUIPMENT AND SUPPLIES (See Also Kind Wanted.)
Boissier Elec. Corp., New York, N. Y.
Hanson-Van Winkle-Munning Co., Newark, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Lustre Co., Inc., The, St. Louis, Mo.
Mercil Plating Equipment Co., Chicago, Ill.
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.

ELECTRO PLATING, JOB & CONTRACT (Also see Polishing and Burnishing; Plating, Barrel Method.)
Hassall, John, Inc., Brooklyn, N. Y.
Meaker, The, Co., Chicago, Ill.
Mercil Plating Equipment Co., Chicago, Ill.
Langbein, Wm., & Bros., Brooklyn, N. Y.
New Haven Sherardizing Co., The, Hartford, Conn.

ELECTRO PLATING & GALVANIZING BARRELS
Boissier Elec. Corp., New York, N. Y.

ELECTROLYTIC NICKEL
The International Nickel Co. (Inc.), New York.

ELECTROTYPING EQUIPMENT & SUPPLIES
Boissier Elec. Corp., New York, N. Y.

EMERY (Also see Abrasives.)
Crown Rheostat & Supply Co., Chicago, Ill.
Keystone Emery Mills, Philadelphia, Pa.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.
Stevens, Frederic B., Detroit, Mich.

EMERY PASTE
Harshaw, Fuller & Goodwin Co., Philadelphia, Pa.

ENAMELING OVENS (See Ovens.)

ENAMELS
Colored
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Hilo Varnish Corp., Brooklyn, N. Y.
G. J. Nikolos & Co., Chicago, Ill.
Maas & Waldstein Co., New York.
Walker Co., Henry V., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., New York.
Zeller Lacquer Mfg. Co., New York.
Lacquer
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Hilo Varnish Corp., Brooklyn, N. Y.
Maas & Waldstein Co., New York.
G. J. Nikolos & Co., Chicago, Ill.
Walker Co., Henry V., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., New York.
Zeller Lacquer Mfg. Co., New York.
Wood
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Hilo Varnish Corp., Brooklyn, N. Y.
Maas & Waldstein Co., New York.
Walker Co., Henry V., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., New York.
Zeller Lacquer Mfg. Co., New York.

ENAMEL SPRAYERS (See Sprayers.)
Furnace
Monarch Engineering & Mfg. Co., Baltimore, Md.
Polishing and Grinding
Divine Bros. Co., Utica, N. Y.

ENGINEERS, COMBUSTION & FURNACE
Surface Combustion Co., The, Toledo, Ohio.

ENGINEERS, POLISHING AND GRINDING
Metal Finishing
Divine Bros. Co., Utica, N. Y.
Norton Co., Worcester, Mass.

EQUIPMENT
Chromium Plating
Chromium Machine Co., Inc., Sag Harbor, L. I.,
Hanson-Van Winkle-Munning Co., Newark, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Electro Plating
Mercil Plating Equipment Co., Chicago, Ill.

# BUYERS' GUIDE: ADVERTISERS' PRODUCTS

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**ESCUTCHEON PINS, ALL METAL**
Hassall, John, Inc., Brooklyn, N. Y.

**ETHYL ACETATE**
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Zapon Co., The, New York, N. Y.

**EXHAUST BOOTHS AND BENCHES FOR LACQUERING**
Bureka Pneumatic Spray Co., Richmond Hill, N. Y.

**EXHAUST FANS AND HEADS** (Also see Blowers and Blow Piping; Dust Collectors and Ventilating Systems.)
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Acid Proof
Duriron, The, Co., Inc., Dayton, Ohio.

**EXHAUST SYSTEMS**
Allington & Curtis Co., Saginaw, Mich.

**EXTRUDED SHAPES**
Brass, Copper and Bronze
Scovill Mfg. Co., Waterbury, Conn.

**FACINGS** (See Foundry Facings.)

**FANS** (Exhaust.)
Allington & Curtis Co., Saginaw, Mich.

**FEEDERS** (Furnace, Wood Waste.)
Allington & Curtis Co., Saginaw, Mich.

**FELT, POLISHING**
Eastern Felt Company, Winchester, Mass.

**FELT POLISHING WHEELS**
Codman, F. L. & J. C., Co., So. Boston, Mass.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.

**FELT SHEETS**
Eastern Felt Company, Winchester, Mass.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.

**FELT WHEELS**
Eastern Felt Company, Winchester, Mass.

**FERRULES, BRASS AND COPPER**
American Brass Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

**FIG CLEANERS** (Also see Cleaning Compounds, Whale Oil Soap.)
International Chemical Co., Philadelphia, Pa.

**FILM COATINGS**
Waukegan Chemical Co., Waukegan, Ill.

**FILTER AERATING & AGITATING SYSTEM**
Belke Mfg. Co., Chicago, Ill.

**FILTER SYSTEM FOR PLATING SOLUTIONS**
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

**FILTER, TANK**
Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago, Ill.

**FIRE BRICK**
Jonathan Bartley Crucible Co., Trenton, N. J.
Norton Co., Worcester, Mass.

**FIRE CEMENT**
Jonathan Bartley Crucible Co., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, Ohio.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co. of Pittsburgh, Pittsburgh, Pa.
Norton Co., Worcester, Mass.
Quigley Furnace Specialties Co., New York.

**FIRE SAND**
Norton Co., Worcester, Mass.

**FITTINGS** (Acid Resistance)
The International Nickel Co. (Inc.), New York, N. Y.

**FLOORING COMPOSITION**
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

**FLUXES**
Soldering and Tinning
Johnson Mfg. Co., Chicago, Ill.
Zapon Co., The, New York, N. Y.

**FORGES, BLAST**
Miner & Peck Mfg. Co., Derby, Conn.

Gas
Surface Combustion Co., The, Toledo, Ohio.

**FORGINGS** (Also see Automobile Forgings.)
Aluminum
Aluminum Company of America, Pittsburgh, Pa.
Nickel and Monel Metal
International Nickel Co. (Inc.), The, New York, N. Y.

**FOUNDRY EQUIPMENT AND SUPPLIES** (See Kind Wanted.)
Campbell-Hausfeld Co., Harrison, Ohio.

**FOUNDRY FACINGS**
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Plumbago Crucible Association, The, New York.
Stevens, Inc., Frederic B., Detroit, Mich.

**FOUNDRY RIDDLES** (See Sand Sifters.)

**FOUNDRY SPRAYERS** (See Sprayers.)
Frictions
Divine Bros. Co., Utica, N. Y.

**FURNACE CEMENT** (See also Fire Cement.)
Campbell-Hausfeld Co., Harrison, Ohio.

**FURNACE ENGINEERS** (See Engineers.)

**FURNACE INSULATION** (See Brick Insulating; Insulating Cement; Insulation, Furnace.)

**FURNACES** (See Annealing Furnaces; Burners; Electric Furnaces; Galvanizing & Tinning Furnaces; Heat Treating Furnaces; Melting Furnaces; Powdered Coal Burning Furnaces; Sherardizing Furnaces; Smelting Furnaces.)
Ajax Metal Co., Philadelphia, Pa.
Surface Combustion Co., The, Toledo, Ohio.

**FURNACE TILE AND LININGS** (Also see Fire Brick.)
Monarch Engineering & Mfg. Co., Baltimore, Md.
Quigley Furnace Specialties Co., New York.

**FUSE METAL**
Platt Bros. & Co., Waterbury, Conn.

**GALVANIZING** (See also Electro Galvanizing Job, and Contract; Hot Galvanizing, Job and Contract.)
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.

**GALVANIZING AND TINNING FURNACES** (Also see Burners.)
Monarch Engineering & Mfg. Co., Baltimore, Md.
Surface Combustion Co., The, Toledo, Ohio.

**GALVANIZING EQUIPMENT AND SUPPLIES** (See Kinds Wanted. Also Plating Galvanizing Machines. Automatic; Hot and Galvanizing Barrels; Plating and Galvanizing and Tinning Equipment.)
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

**GAS APPLIANCES**
Johnson Gas Appliance Co., Cedar Rapids, Ia.
Surface Combustion Co., The, Toledo, Ohio.

**GAS BURNERS** (See Burners.)

**GATE CUTTERS** (See Saws; Sprue Cutters.)

**GENERATORS** (See Dynamos; Motor-Generator Sets.)
Chandeysson Electric Co., St. Louis, Mo.
Electric Products Co., The, Cleveland, Ohio.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Lustre Co., Inc., The, St. Louis, Mo.
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.

**GLUE FOR POLISHING**
Daniels & Orben Co., New York.
Divine Bros. Co., Utica, N. Y.

**GLUE HEATERS AND POTS**
Divine Bros. Co., Utica, N. Y.

**GOLD** (See Anodes; Bars; Metal Dealers; Smelters and Refiners.)

**GRAPHITE PRODUCTS PHOSPHORIZERS STIRRERS, ETC.** (Also see Crucibles.)
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Naugatuck Valley Crucible Co., Shelton, Conn.
Plumbago Crucible Association, The, New York.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.

**GREASELESS COMPOSITIONS**
Lea Mfg. Co., The, Waterbury, Conn.

**GRINDING MACHINES**
Cisco Machine Tool Co., The, Cincinnati, Ohio.
Divine Bros. Co., Utica, N. Y.
Norton Co., Worcester, Mass.
Stevens, Inc., Frederic B., Detroit, Mich.

**GRINDING WHEEL HOODS** (See Dust Collectors and Ventilating Systems; Hoods.)

**HARD RUBBER FITTINGS**
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.

Pipe
Belke Mfg. Co., Chicago, Ill.

Hard Rubber Tanks
American Hard Rubber Co., New York.

**HEAT TREATING FURNACES**
Surface Combustion Co., The, New York, N. Y.

**HOODS** (Also see Dust Collectors and Ventilating Systems.)

Polishing and Grinding Wheel
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Spraying
De Vilbiss Mfg. Co., Toledo, Ohio.

**HOT GALVANIZING AND TINNING EQUIPMENT** (See Burners; Galvanizing and Tinning Furnaces; Kettles; Tanks.)

**HOT TINNING EQUIPMENT** (See Hot Galvanizing and Tinning Equipment.)

**HYDRAULIC MACHINERY, PRESSES, JACKS, ETC.** (Also see Accumulators, Presses.)
Farrel Foundry & Machine Co., Ansonia, Conn.
Watson-Stillman Co., New York.

**INGOTS** (Also see Calcium-Copper; Manganese-Copper; Phosphor-Copper; Phosphor-Tin; Silicon-Copper; Smelters and Refiners.)

Aluminum
Aluminum Company of America, Pittsburgh, Pa.
British Aluminium Co., New York and Toronto, Ontario.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Brass, Bronze and Composition
Ajax Metal Company, Philadelphia, Pa.
Belmont Smelting & Refining Works, Brooklyn, N. Y.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Copper
Hendricks Bros., New York.
Trotter, Nathan, & Co., Philadelphia, Pa.

Electrolytic
International Nickel Co. (Inc.), The, New York, N. Y.

Lead
United Metals Selling Co., New York.

Nickel
The International Nickel Co. (Inc.), New York, N. Y.

Silver
Handy & Harman, New York.

Tin
Ajax Metal Co., Philadelphia, Pa.

White Metals
Michigan Smelting & Refining Co., Detroit, Mich.

**INSULATING BRICK, BLOCK, POWDER AND CEMENT** (See also Brick.)
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

**INSULATING CEMENT, HEAT**
Armstrong Cork & Insulation Co., Pittsburgh, Pa
Quigley Furnace Specialties Co., New York.

**INSULATION** (Also see Brick, Insulating, Insulating Cement.)

Boiler
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Oven
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Furnace
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Pipe
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

**IRON CASTINGS** (See Castings)

**JAPAN REMOVERS**
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.

**JAPANS, ALL KINDS**
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Hilo Varnish Corp., Brooklyn, N. Y.
Zapon Co., The, New York, N. Y.

**JAPANNING BARRELS** (See Tumbling Barrels.)

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JAPANNING OVENS (See Ovens.)

JEWELERS' EQUIPMENT (Also see Kind Wanted)
Leiman Bros., New York.
Smith-Richardson Co., Attleboro, Mass.

JEWELERS' ROLLS (See Rolls.)

JEWELERS' SOLDER (See Solders.)

JIGS, FIXTURES, ETC. (See Tools, Jigs, Fixtures.)

LABORATORIES (See Testing Laboratories.)

LABORATORY WARE
Norton Co., Worcester, Mass.

LACQUERING BARRELS (See Tumbling Barrels.)

LACQUER ENAMELS (See Enamels.)
Walker, Henry V., Co., New York.
Zeller Lacquer Mfg. Co., New York.

LACQUERS
Colored
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Hilo Varnish Corp., Brooklyn, N. Y.
Maas & Waldstein Co., New York.
G. J. Nikolos & Co., Chicago, Ill.
Walker, Henry V., Co., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., New York.
Zeller Lacquer Mfg. Co., New York.
For Incandescent Lamps
Egyptian Lacquer Mfg. Co., New York.
Metal
Anderson Chemical Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., New York.
G. J. Nikolos & Co., Chicago, Ill.
Walker, Henry V., Co., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon Co., The, New York.
Zeller Lacquer Mfg. Co., New York.
Wood
Anderson Chemical Co., New York.
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Walker Co., Henry V., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zapon, The, Co., New York.
Zeller Lacquer Mfg. Co., New York.

LACQUER REMOVERS
Egyptian Lacquer Mfg. Co., New York.
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.

LACQUER SPRAYERS (See Sprayers.)

LACQUERING
Mercil Plating Equipment Co., Chicago, Ill.

LADLE HEATERS AND DRYERS
Monarch Engineering & Mfg. Co., Baltimore, Md.

LATHES (See also Polishing Lathes.)
Polishing
Cisco Machine Tool Co., The, Cincinnati, Ohio.
Metal Spinning and Wood Turning
Pryibil, P., Machine Co., New York.

LEAD BURNING
Abernethy, John F., & Co., Inc., Brooklyn, N. Y.

LEAD-LINED TANKS (See Tanks).

LEATHER POLISHING WHEELS (See Buffing and Polishing Wheels.)

LOCOMOTIVES, INDUSTRIAL (See Electric Locomotives.)

LUBRICANTS, Cutting and Grinding, Drawing, Stamping
International Chemical Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

MACHINERY
Cleaning Metal (Mech.)
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.
Dry Metal (Mech.)
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.
Pickling Metal (Mech.)
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.
Galvanizing (Mech.)
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.
Plating (Mech.)
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.

MAGNETIC SEPARATORS (See also Reclaiming Machinery.)

MANGANESE
Metal & Thermit Corp., New York.

MANGANESE-COPPER (Also see Ingots.)
Ajax Metal Co., Philadelphia, Pa.
Metal & Thermit Corp., New York.

MANTLE DIP
E. I. Du Pont de Nemours, Inc., Wilmington, Del.
Zapon Co., The, New York, N. Y.

MELTING FURNACES (Also see Burners; Galvanizing and Tinning Furnaces; Tank Furnaces.)
Campbell-Hausfeld Co., Harrison, Ohio.
Coal and Coke
Monarch Engineering & Mfg. Co., Baltimore, Md.
Oil or Gas
Campbell-Hausfeld Co., Harrison, Ohio.
Johnson Gas Appliance Co., Cedar Rapids, Ia.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Surface Combustion Co., The, Toledo, Ohio.
Pit
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Inc., Frederic B., Detroit, Mich.
Reverberatory
Monarch Engineering & Mfg. Co., Baltimore, Md.

METAL BRIQUETTES (See Briquet-Ingots.)

METAL CLEANERS (See also Cleaning Compounds.)
Cowles Detergent Co., Cleveland, Ohio.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
International Chemical Co., Philadelphia, Pa.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Brooklyn, N. Y.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.
Sulphur Products Co., Greensburg, Pa.

METAL DEALERS (Also see Drosses, Residues, Etc., Buyers of; Turnings, Chips, Etc., Buyers of.)
Gold, Silver, Platinum
Radnai, Josef, New York.
Roessler and Hasslacher Chemical Co., New York.
New Metals
Trotter, Nathan, & Co., Philadelphia, Pa.
Old Metals
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y.
Rare Metals
Radnai, Josef, New York.

METAL DRYERS, CENTRIFUGAL
Tolhurst Machine Works, Troy, N. Y.

METAL GOODS MADE TO ORDER (Also see Stamping and Drawing.)
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Scovill Mfg. Co., Waterbury, Conn.

METAL POLISH
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.

METAL RECLAIMING EQUIPMENT (See Concentrating Tables; Crushers and Pulverizers; Magnetic Separators.)

METAL SPECIALTIES
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

METALS (See also Kinds Wanted. Also Metal Dealers.)
Acid Resistant
The Duriron Co., Dayton, Ohio.
The International Nickel Co. (Inc.), New York, N. Y.
Bearing
American Brass Co., Waterbury, Conn.
Extruded and Die Pressed
American Brass Co., Waterbury, Conn.

METALS, PLATED SHEET (See Plated and Polished Sheet Metals; Sheets.)

METALS, RARE (See Metal Dealers.)

METERS — ELECTRICAL MEASURING —
Wilson-Maeulen Co., Inc., New York.

MILLS, CRUSHING (See also Crushers and Pulverizers.)
Hardinge Company, New York.

MOLD DRYERS, PORTABLE
Monarch Engineering & Mfg. Co., Baltimore, Md.

MOLDING MACHINES
Power
Turner Foundry & Machine Co., Philadelphia, Pa.

MOLDING SAND (See Sand.)

MOLDINGS & EXTRUDED SHAPES
Aluminum
Aluminum Company of America, Pittsburgh, Pa.

MOLDS (See also Mold Makers.)
Babbitt and Solder
Fanning, J. P., Co., Brooklyn, N. Y.
Schweizer, Chas. K., St. Louis, Mo.
Ingot
Fanning, J. P., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Schweizer, Chas. K., St. Louis, Mo.

MOLD SPRAYERS (See Sprayers.)

MOTOR CONTROL EQUIPMENT (See also Electrical Apparatus and Equipment.)

MOTORS (Also see Electrical Apparatus and Equipment.)
Electric Products Co., The, Cleveland, O.
Electric
Chandeysson Electric Co., St. Louis, Mo.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

MOTOR-GENERATOR SETS (Also see Dynamos; Electrical Apparatus and Equipment.)
Chandeysson Electric Co., St. Louis, Mo.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Electric Products Co., The, Cleveland, O.
Jants & Leist Electric Co., Cincinnati, Ohio.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
Plating and Galvanizing
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.

MOULD MAKERS
Adamac, F., New York.

MUFFLES
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Norton Co., Worcester, Mass.

MUNTZ METAL (See Sheets.)

NICKEL (See Anodes; Castings; Sheets; Wire; Etc.)

NICKEL, BORONIC

NICKEL CARBONATE, MOIST AND DRY
Harshaw, Fuller & Goodwin Co., Cleveland, Ohio.

NICKEL CHLORIDE
Harshaw, Fuller & Goodwin Co., Cleveland, Ohio.
Roessler & Hasslacher Chemical Co., New York, N. Y.

NICKEL (Electrolytic.)
The International Nickel Co. (Inc.), New York, N. Y.

NICKEL OXIDE
The International Nickel Co. (Inc.), New York, N. Y.

NICKEL SALTS
Apothecaries Hall Co., Waterbury, Conn.
Buchanan, Thos., Co., Cincinnati, Ohio.
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben Co., New York.
Hanson-Van Winkle-Munning Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, Ohio.
MacDermid Incorporated, Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.
Stevens, Frederic B., Detroit, Mich.

NICKEL SHOT
The International Nickel Co. (Inc.), New York, N. Y.
Seymour Mfg. Co., Seymour, Conn.

NICKEL SILVER (See also Brass, Sheets, Wire, Rod, Tube Castings; Forgings, Sheets; etc.)
Western Cartridge Co., Alton, Ill.

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**Sheets, Wire, Rod, Tube**
American Brass Co., Waterbury, Conn.
Cooklin, T. E., Brass & Copper Co., New York.
Ecovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rolling Mills, Waterbury, Conn.

NICKEL SULPHATE, SINGLE AND DOUBLE
Harshaw, Fuller & Goodwin Co., Cleveland, Ohio.

OIL BURNERS (See Burners.)

OIL PUMPS (See also Oil Storage Systems.)
Monarch Engineering & Mfg. Co., Baltimore, Md.

OLD METALS (See Drosses, Residues, Etc., Buyers of; Metal Dealers.)

OVENS (Also see Burners; also Core Ovens.)
**Enameling, Lacquering, Japanning**
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Steiner & Co., E. E., Newark, N. J.
Surface Combustion Co., The, Toledo, Ohio.

OVEN BURNERS (See Burners.)

OVEN INSULATION (See Brick, Insulating; Insulating Cement; Insulation.)

OXIDIZING SOLUTIONS
Sulphur Products Co., Greensburg, Pa.

PANELS
**Bakelite**
Mercil Plating Equipment Co., Chicago, Ill.

PAINT SPRAYERS (See Sprayers.)

PATTERN SHOP EQUIPMENT (See Lathes; Saws.)

PAVING BRICK, CORK (See Brick.)

PHOSPHOR BRONZE (See also Ingots.)
Ajax Metal Co., Philadelphia, Pa.
Western Cartridge Co., Alton, Ill.

PHOSPHORIZERS (See Graphite Products.)

PHOSPHOR-COPPER (Also see Ingots.)
Ajax Metal Co., Philadelphia, Pa.

PHOSPHOR-COPPER, BORONIC
American Boron Products Co., Buffalo, N. Y.

PHOSPHOR-TIN (See also Ingots.)
Ajax Metal Co., Philadelphia, Pa.

PHOSPHORUS
General Chemical Co., Philadelphia, Pa.

PICKLING COMPOUND (See Cleaning Compounds.)

PIPE ALUMINUM
Aluminum Company of America, Pittsburgh, Pa.

PIPE, BRASS AND COPPER
American Brass Co., Waterbury, Conn.
Ecovill Mfg. Co., Waterbury, Conn.

PIPE AND BOILER COVERINGS, STEAM, ICE WATER, BRINE (See also Insulation.)
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

PIPE AND FITTINGS
**Acid Proof**
Duriron, The, Co., Inc., Dayton, Ohio.
The International Nickel Co. (Inc.), New York, N. Y.
**Acid Proof. Hard Rubber.**
American Hard Rubber Co., New York.

PISTON, RODS, TOBIN BRONZE
American Brass Co., Waterbury, Conn.

PLATED AND POLISHED SHEET METALS (See also Sheets.)
American Nickeloid Co., Peru, Ill.

PLATERS' BRUSHES (See Brushes.)

PLATERS' BUCKETS, DIPPERS & PITCHERS
Belke Mfg. Co., Chicago, Ill.

PLATERS' COMPOUND (See Whale Oil Soap.)

PLATING
General Chromium Corp., Detroit, Mich.
New Haven Sherardizing Co., Hartford, Conn.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

**Cadmium**
New Haven Sherardizing Co., Hartford, Conn.
Udylite Process Co., Kokomo, Ind.

**Chromium**
Chromium Corp. of America.
National Chromium Corp., New York, N. Y.
United Chromium Inc., Detroit, Mich.

PLATING BARRELS, ROTARY
Lasalco, Inc., St. Louis, Mo.
Meaker, The, Co., Chicago, Ill.

PLATING AND GALVANIZING BARRELS
Connecticut Dynamo & Motor Co., Irvington, N. J.
Daniels & Orben Co., Inc., New York.
Meaker, The, Co., Chicago, Ill.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING AND GALVANIZING MACHINES, AUTOMATIC (Also see Plating Barrels.)
Lasalco, Inc., St. Louis, Mo.
Meaker, The, Co., Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING, BARREL METHOD, JOB AND CONTRACT (See Electroplating.)
Mercil Plating Equipment Co., Chicago, Ill.

PLATING EQUIPMENT AND SUPPLIES (See also Kind Wanted.)
Daniels & Orben Co., Inc., New York, N. Y.
Lustre Co., Inc., The, St. Louis, Mo.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING GENERATORS
Chandeyson Electric Co., St. Louis, Mo.
Electric Products Co., The, Cleveland, O.
Holland, J., & Sons, Brooklyn, N. Y.
Lasalco, Inc., St. Louis, Mo
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING MATERIALS
Meaker, The, Co., Chicago, Ill.

PLATING RACKS
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.

PLATING SOLUTION AGITATOR
Belke Mfg. Co., Chicago, Ill.

PLATING SOLUTION FILTER SYSTEM
Belke Mfg. Co., Chicago, Ill.

PLATING SOLUTION TESTERS
Stirlen Co., The, New Haven, Conn.

PLATINUM (See Smelters and Refiners; Anodes; Bars; Metal Dealers; Sheets; Etc.)

PLATINUM BUFFING CAKE (See Buffing and Polishing Compositions.)

PLUMBAGO (See Graphite Products.)
Belke Mfg. Co., Chicago, Ill.

POLISHERS, FLOOR AND BENCH
Cisco Machine Tool Co., The, Cincinnati, Ohio.
Hill-Curtis Co., Kalamazoo, Mich.

POLISHING ABRASIVES
Abrasive Company, Bridesburg, Philadelphia, Pa.
Keystone Emery Mills, Philadelphia, Pa.
Zucker Sons Co., Inc., Elizabeth, N. J.

POLISHING COMPOSITION (See Buffing and Polishing Compositions.)
Lea Mfg. Co., The, Waterbury, Conn.
Lustre Co., Inc., The, St. Louis, Mo.
Zucker Sons Co., Inc., Elizabeth, N. J.

POLISHING DUST COLLECTING OUTFITS
**Small**
Leiman Bros., New York.

POLISHING EQUIPMENT AND SUPPLIES (See also Kinds Wanted.)
Cisco Machine Tool Co., The, Cincinnati, Ohio.
Hill-Curtis Co., Kalamazoo, Mich.

POLISHING FELTS
Eastern Felt Co., Winchester, Mass.

POLISHING HOODS (See Dust Collectors and Ventilating Systems; Hoods.)

POLISHING LATHES AND HEADS
Cisco Machine Tool Co., The, Cincinnati, Ohio.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Hanson-Van Winkle-Munning Co., Newark, N. J.
Hill-Curtis Co., Kalamazoo, Mich.
Stutz, Geo. A., Mfg. Co., Chicago, Ill.

POLISHING MACHINES (Also see Polishing Lathes and Heads.)
**Automatic**
Acme Mfg. Co., Detroit, Mich.

POLISHING MATERIALS
Keystone Emery Mills, Philadelphi, Pa.
Zucker Sons Co., Inc., Elizabeth, N. J.

POLISHING MOTORS, ELECTRIC (See Polishing Lathes.)

POLISHING AND BURNISHING; JOB AND CONTRACT (See also Electro Plating.)

POLISHING AND GRINDING ENGINEERS (See Engineers.)
Divine Bros. Co., Utica, N. Y.

POLISHING WHEELS (See Buffing and Polishing Wheels.)
Advance Wheel Mfg. Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.

POTASH
**First Sorts**
International Chemical Co., Philadelphia, Pa.
**Real**
International Chemical Co., Philadelphia, Pa.

POTASSIUM CYANIDE
Roessler & Hasslacher Chemical Co., New York.

POWDERED COAL BURNERS (See Burners.)

POWDERED METALS
**Aluminum**
Aluminum Company of America, Pittsburgh, Pa.

BONZE
du Pont de Nemours, E. I., Inc., Wilmington, Del.

PRESSES (Also see Scrap Baling Machine.)
**Bench and Foot**
Baird Machine Co., Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
**Cabbaging**
Farrel Foundry & Machine Co., Ansonia, Conn.
**Hydraulic**
Watson-Stillman Co., New York.
**Power, All Types**
Baird Machine Co., Bridgeport, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Mackintosh-Hemphill Co., Pittsburgh, Pa.
Miner & Peck Mfg. Co., Derby, Conn.

PRESSES, DROP LIFTERS FOR
Miner & Peck Mfg. Co., Derby, Conn.

PRESSURE BLOWERS (See Blowers and Blow-Piping.)

PULVERIZERS
Standard Equipment Co., New Haven, Conn.

PUMPS
**Centrifugal. Acid Proof**
Duriron, The, Co., Inc., Dayton, Ohio.
**Hard Rubber. Acid Proof.**
American Hard Rubber Co., New York.
Chicago Hard Rubber Supply Co., Chicago, Ill.
**Reciprocating. Acid Proof.**
Duriron, The, Co., Inc., Dayton, Ohio.

PYROMETERS
Illinois Testing Laboratories, Inc., Chicago, Ill.
Thwing Instrument Co., Philadelphia, Pa.
Wilson-Maeulen Co., Inc., New York, N. Y.

RACKS—Rubber Covering for
American Hard Rubber Co., New York.
Chicago Hard Rubber Supply Co., Chicago, Ill.

RECLAIMING MACHINERY, METAL (Also see Concentrating Tables; Crushers and Pulverizers; Magnetic Separators.)
Eastern Machinery Co., New Haven, Conn.
Hardinge Company, New York.
Standard Equipment Co., New Haven, Conn.

RECORDING INSTRUMENTS
Thwing Instrument Co., Philadelphia, Pa.

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RECORDING THERMOMETERS (See Thermometers.)

REFINERS AND SMELTERS (See Smelters and Refiners.)

REFRACTORY MATERIAL (Firesand.)
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Norton Co., Worcester, Mass.

REFRACTORIES
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Norton Co., Worcester, Mass.

RETORTS, GRAPHITE
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Plumbago Crucible Association, The, New York.

RHEOSTATS (See also Electrical Apparatus and Equipment.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Daniels & Orben Co., New York.
Hanson-Van Winkle-Munning Co., Newark, N. J.

RIDDLES (See Foundry Riddles.)

RIVET MAKING MACHINERY

RIVETS, NAILS & TACKS, ALL METALS
Hassall, John, Inc., Brooklyn, N. Y.

RODS AND BARS (Also see Brass Mill Products.)
Aluminum
Aluminum Company of America, Pittsburgh, Pa.
British Aluminum Co., Ltd., New York-Toronto, Can.
Strahs Aluminum Co., New York.

Brass, Bronze and Copper
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Scovill Mfg. Co., Waterbury, Conn.

ROLLING MILL MACHINERY (See also Draw Benches; Hydraulic Machinery; Presses; Rolls; Shears; Slitters.)
Farrel Foundry & Machine Co., Ansonia, Conn.

ROLLS
Chilled and Sand Iron
Farrel Foundry & Machine Co., Ansonia, Conn.
Mackintosh-Hemphill Co., Pittsburgh, Pa.

Jewelers'
Leiman Bros., New York.
Mackintosh-Hemphill Co., Pittsburgh, Pa.

ROLLS AND COILS (See Sheets and Strip Metal.)

Brass, Copper and Bronze
Scovill Mfg. Co., Waterbury, Conn.

ROUGE (See Buffing and Polishing Compositions.)
Zucker Sons Co., Inc., Elizabeth, N. J.

RUBBER TANKS
American Hard Rubber Co., New York.

RUST PREVENTIVES
International Chemical Co., Philadelphia, Pa.
New Haven Sherardizing Co., Hartford, Conn.
Oakite Products, Inc., New York, N. Y.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

RUST PROOF PROCESS
New Haven Sherardizing Co., Hartford, Conn.

RUST REMOVERS
International Chemical Co., Philadelphia, Pa.

SAND
Molding
For Sand Blasting
Standard Equipment Co., New Haven, Conn.

SAND BLASTS
Accessories.
Pangborn Corp., Hagerstown, Md.
Standard Equipment Co., New Haven, Conn.
Barrel,
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corporation, Hagerstown, Md.
Standard Equipment Co., New Haven, Conn.
Cabinet
Astle, H. J., & Co., Providence, R. I.
Leiman Bros., New York.
Standard Equipment Co., New Haven, Conn.
Sand Blast Systems
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corp., Hagerstown, Md.
Standard Equipment Co., New Haven, Conn.

SAND BLASTS AND EQUIPMENT
Pangborn Corporation, Hagerstown, Md.
Standard Equipment Co., New Haven, Conn.

SAND SIFTERS
Turner Foundry & Machine Co., Philadelphia, Pa.

SAWDUST DRYING-OUT BOXES (Also see Drying-Out Machines.)
Smith-Richardson Co., Attleboro, Mass.

SAWDUSTLESS METAL DRYERS
Tolhurst Machine Co., Troy, N. Y.

SCRAP METAL DEALERS (See Drosses, Residues, Etc., Buyers of; Turnings, Chips, Etc., Buyers of; Metal Dealers.)

SCREW MACHINE PRODUCTS (Also see Machine Products.)
Economy Machine Products Co., Chicago, Ill.
Scovill Mfg. Co., Waterbury, Conn.

SEPARATORS, MAGNETIC (See Magnetic Separators.)

SHEARS (Se Slitters.)

SHEEPSKIN POLISHING WHEELS
Codman, F. L. & J. C., Co., So. Boston, Mass.

SHEET FELT
Eastern Felt Co., Winchester, Mass.

SHEET METAL PIPING FOR ALL PURPOSES
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

SHEET METAL SPECIALTIES
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

SHEET METAL WORK
Allington & Curtis Co., Saginaw, Mich.

SHEETS (Also see Brass Mill Products; Strip Metal.)
Aluminum
Aluminum Company of America, Pittsburgh, Pa.
British Aluminium Co., Ltd., New York-Toronto, Canada.
Strahs Aluminum Co., New York.

Brass, Copper and Nickel Silver
American Brass Co., Waterbury, Conn.
Bristol Brass Co., Bristol, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Dallas Brass & Copper Co., Chicago, Ill.
New England Brass Co., Taunton, Mass
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rolling Mills, Waterbury, Conn.

Bronze
Conklin, T. E., Brass & Copper Co., New York.
New England Brass Co., Taunton, Mass.

Copper
Conklin, T. E., Brass & Copper Co., New York.
Hussey, C. G., & Co., Pittsburgh, Pa.

Muntz's Metal
Taunton-New Bedford Copper Co., Taunton, Mass.

Nickel and Monel Metal
International Nickel Co. (Inc.), The, New York, N. Y.

Nickel-Silver
New England Brass Co., Taunton, Mass.
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rolling Mills, Waterbury, Conn.

Plated and Polished
American Nickeloid Co., Peru, Ill.

Platinum
Roessler & Hasslacher Chemical Co., New York.

Silver, Sterling
Handy & Harman, New York.
Jackson, John J., Co., Newark, N. J.

Zinc
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.

SHERARDIZING
New Haven Sherardizing Co., Hartford, Conn.

SHERARDIZING FURNACES AND EQIUPMENT
New Haven Sherardizing Co., Hartford, Conn.

SILICON COPPER
Ajax Metal Co., Philadelphia, Pa.

Boronic
American Boron Products Co., Buffalo, N. Y.

SILVER (See Smelters and Refiners; Anodes Bars; Castings; Ingots; Metal Dealers; Sheets; Solder; Etc.)

SILVER CYANIDE
Roessler & Hasslacher Chemical Co., New York.

SLAB ZINC
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Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.

SLAG CRUSHERS (See Crushers and Pulverizers.)

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Copper-Bearing Material
Ajax Metal Co., Philadelphia, Pa.
Gold
Handy & Harman, New York.
International Nickel Co., (Inc.), The, New York, N. Y.

Platinum
Roessler & Hasslacher Chemical Co., New York.

Silver
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White Metals
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Daniels & Orben Co., New York.
Roessler & Hasslacher Chemical Co., New York.

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Tinners
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SOLDER MOLDS (See Molds.)

SOLDERING FLUX (See Fluxes.)

SOLUTION FILTER SYSTEM
Beike Mfg. Co., Chicago, Ill.

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Nickel
Sulphur Products Co., Greensburg, Pa.

SOLVENTS
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du Pont de Nemours, E. I., Inc., Wilmington, Del.
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Zapon, The, Co., New York.
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SPECIAL MACHINERY FOR NON-FERROUS MFG.
Torrington Mfg. Co., Torrington, Conn.

SPECIALTIES, METAL (See Wire Specialties; Wire Shapers and Forms; Metal Goods Made to Order.)

SPELTER (See Slab Zinc; also see Ingots.)

SPELTER CHUCKS (See Chucks.)

SPINNING
Job & Contract

SPINNING LATHES (See also Lathes.)
Pryibil, P., Machine Co., New York.

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**(Advertisers are entitled to one listing for each sixteenth page of space)**

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De Vilbiss Mfg. Co., Toledo, Ohio.
Lacquer, Enamel, Japan, Paint
DeVilbiss Mfg. Co., Toledo, Ohio.
Economy Machine Products Co., Chicago, Ill.
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.
G. J. Nikolos & Co., Chicago, Ill.
Ideal Air Brush Mfg. Co., New York.

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Ideal Air Brush Mfg. Co., New York.

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Ideal Air Brush Mfg. Co., New York.

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Scovill Mfg. Co., Waterbury, Conn.

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Baird Machine Co., Bridgeport, Conn.
Beaver, H. Leroy, Co., Philadelphia, Pa.
Crown Rheostat & Supply Co., Chicago, Ill.
Hartford Steel Ball Co., The, Hartford, Conn.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Smith-Richardson Co., Attleboro, Mass.

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**STIRRERS** (See Graphite Products.)
**STOKERS, CHAIN GRATE**
Wood Waste
Allington & Curtis Co., Saginaw, Mich.
Babcock & Wilcox Co., New York.

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General Ceramics Co., New York.
U. S. Stoneware Co., New York.

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New England Brass Co., Taunton, Mass.
Nickel and Monel
The International Nickel Co. (Inc.), New York, N. Y.

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Roessler & Hasslacher Chemical Co., New York.
Zapon Co., The, New York, N. Y.

**SULPHUR, LIQUID**
Sulphur Products Co., Greensburg, Pa.

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American Hard Rubber Co., New York.
Lead Lined
Abernethy, John F., & Co., Inc., Brooklyn, N. Y.
Hanson-Van Winkle-Munning Co., Newark, N. J.
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General Ceramics Co., New York.
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.
U. S. Stoneware Co., New York.
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Boissier Elec. Corp., New York, N. Y.
U. S. Galvanizing & Pltg. Equip. Corp., Brooklyn, N. Y.
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Stone
General Ceramics Co., New York.
U. S. Stoneware Co., New York.
Wood
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Meaker, The, Co., Chicago, Ill.

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Stirlen Co., The, New Haven, Conn.
Hardness
Wilson-Maeulen Co., Inc., New York, N. Y.
Plating Solution
Stirlen Co., The, New Haven, Conn.

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New York Testing Laboratories, New York.
Pitkin, Lucius, Inc., New York.

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Norton Co., Worcester, Mass.

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**TINNING** (See Electro-Plating, Hot Galvanizing and Tinning.)

**TINNING FURNACES** (See Galvanizing and Tinning Furnaces.)
Surface Combustion Co., The, Toledo, Ohio.

**TINNING FLUXES** (See Fluxes.)

**TOOL HARDENING FURNACES** (See Heat Treating Furnaces.)
Surface Combustion Co., The, Toledo, Ohio.

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American Tripoli Co., Seneca, Mo.

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Torrington Mfg. Co., Torrington, Conn.

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Aluminum Company of America, Pittsburgh, Pa.
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
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Scovill Mfg. Co., Waterbury, Conn.
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Penn Brass & Copper Co., Inc., Erie, Pa.

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Globe Machine & Stamping Co., Cleveland, Ohio.
Henderson Bros. Co., Waterbury, Conn.
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Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, Ohio.
Henderson Bros. Co., Waterbury, Conn.
Japanning
Baird Machine Co., Bridgeport, Conn.
Lacquering
Baird Machine Co., Bridgeport, Conn.
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**TUNGSTEN**
Metal & Thermit Corp., New York.

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Springless

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International Chemical Co., Philadelphia, Pa.

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Ajax Metal Co., Philadelphia, Pa.

**WHITE POLISH**
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British Aluminum Co., Ltd., New York-Toronto Canada.
Brass, Bronze, Copper and Nickel-Silver, Etc.
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Scovill Mfg. Co., Waterbury, Conn.

**WIRE FORMING MACHINERY** (See also Cutting, Straightening and Forming Machinery.)
Baird Machine Co., Bridgeport, Conn.

**WIRE FURNACES**
Surface Combustion Co., The, Toledo, Ohio.

**WIRE MILL PRODUCTS** (See also Brass Mill Products; Wire.)
Farrel Foundry & Machine Co., Ansonia, Conn.

**WIRE STRAIGHTENING AND CUTTING MACHINERY** (See Cutting, Straightening and Forming Machinery.)
Shuster Co., The F. B., New Haven, Conn.

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**WIRING DEVICES** (See Electrical Apparatus and Equipment.)

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Hilo Varnish Corp., Brooklyn, N. Y.

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American Cyanamid Co., New York.
Roessler & Hasslacher Chemical Co., New York.

**ZINC DUST**
Grasselli Chemical Co., Cleveland, Ohio.

**ZINC ELECTROLYTIC**
United Metals Selling Co., New York.

**ZINC PLATING** (See Electro-Galvanizing.)

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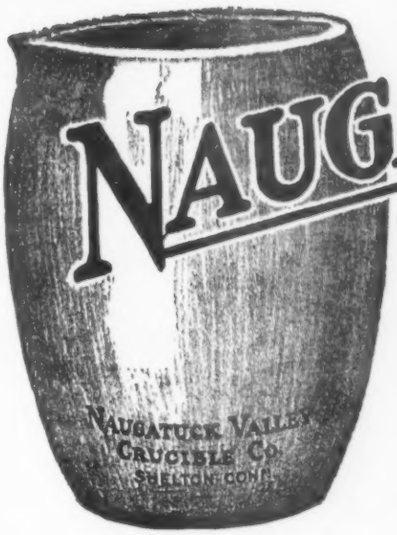


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3. CLEANING STEEL PARTS BEFORE PAINTING & ENAMELLING
   Using International #89B—about 2½ ounces to the gallon of water. Cost—$.558 per 1,000 square feet.
4. CLEANING FLOORS, WALLS, WASH BOWLS, ETC.
   Using International #77—about 4 ounces to the bucket of water.

*Are you interested in the details of these operations? If so, just write for a free copy of the survey.*

Internationally yours, John Bright

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